THE AEROPLANE and ASTRONAUTICS

AUGUST 24, 1961

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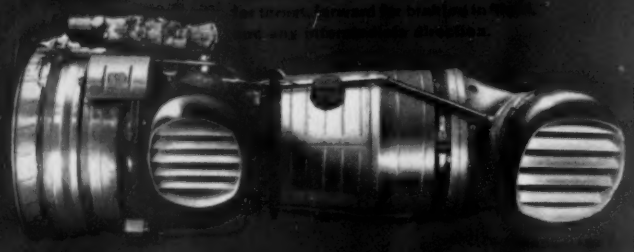

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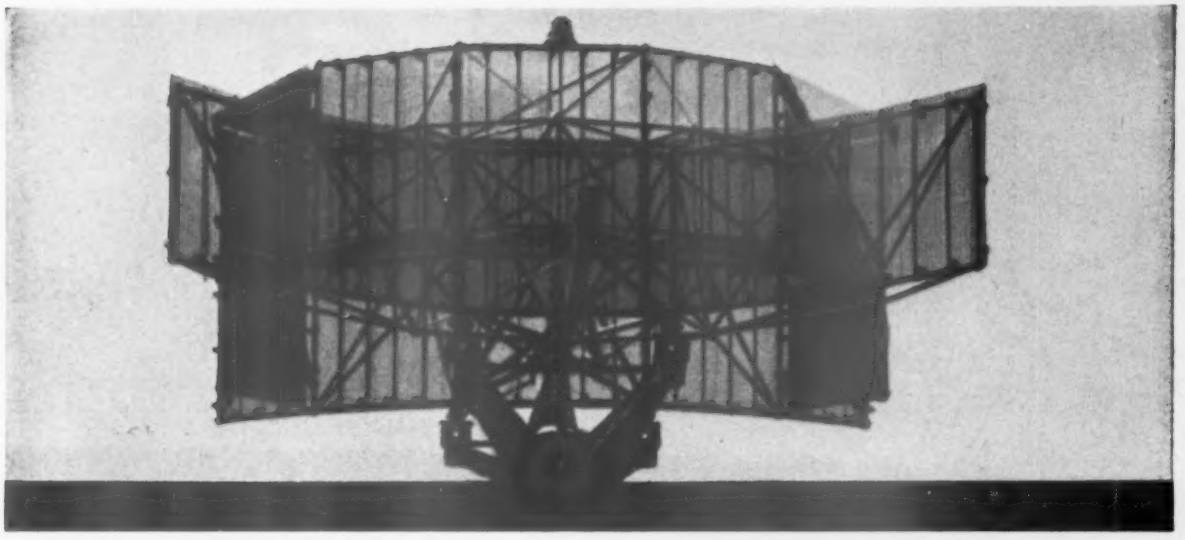

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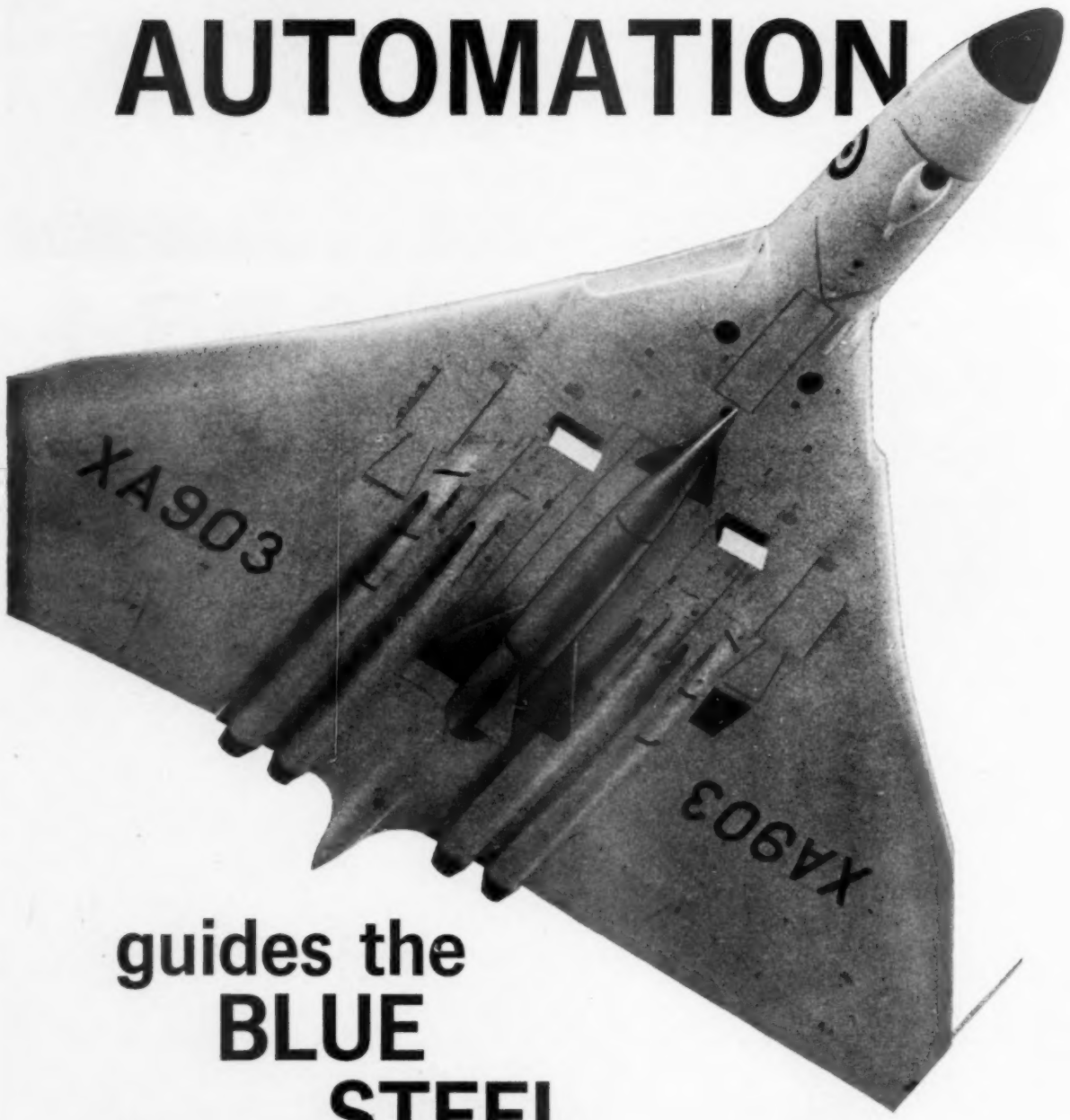

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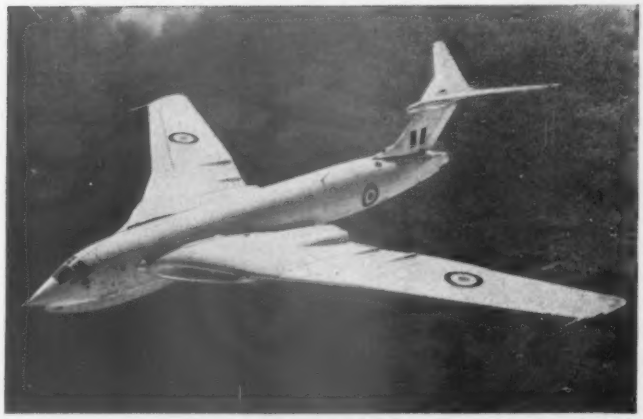

Above is the Handley Page Victor B2, which together with the AVRO Vulcan forms Britain's Blue Steel carrier team.

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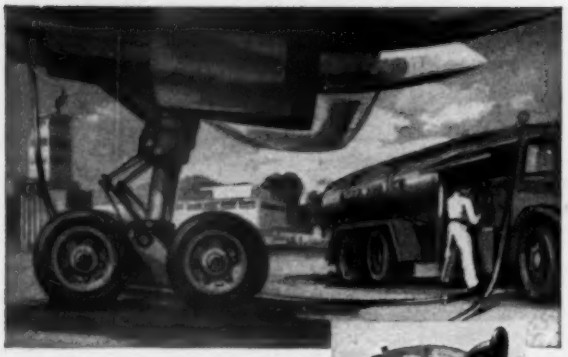

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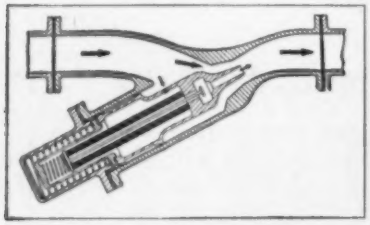

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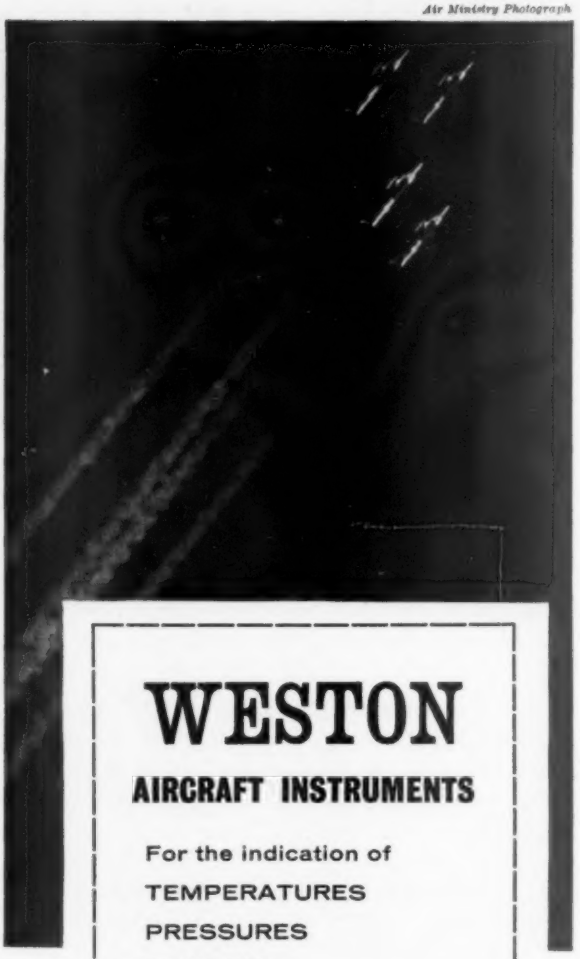

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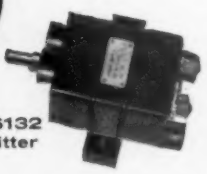
*Model S216 Indicator



*Model S132 Transmitter

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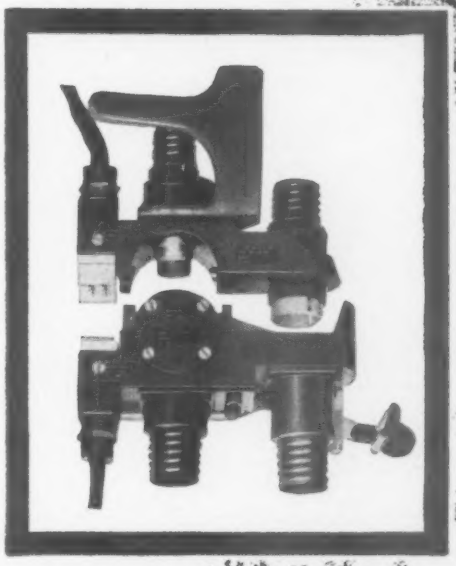

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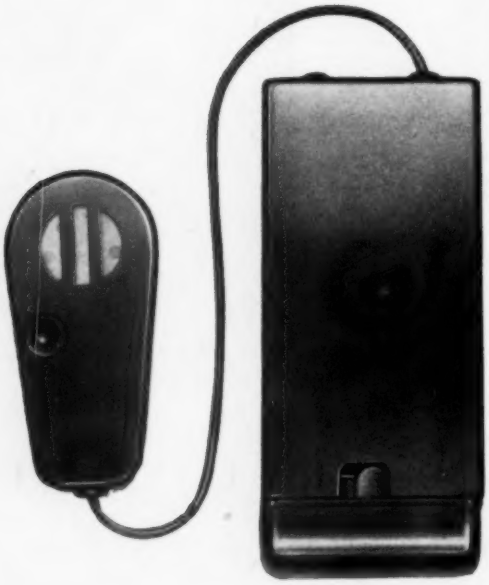

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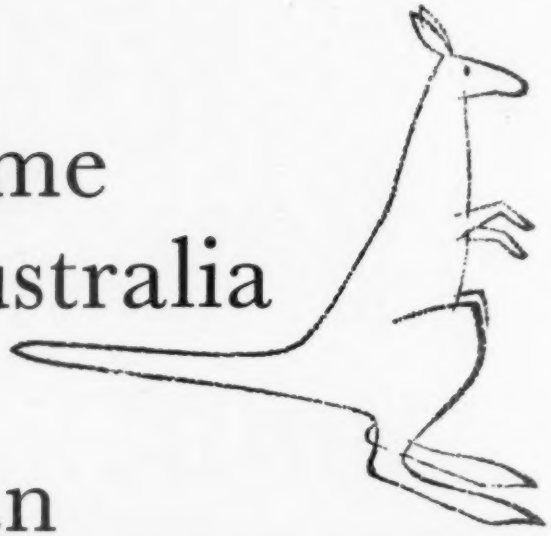

HAWKER SIDDELEY AVIATION

32, Duke St., St. James's, London S.W.1

THE AEROPLANE and ASTRONAUTICS

VOLUME 101 NUMBER 2601 AUGUST 24, 1961

In Full Cry

To get a new prototype into the air in nine months is something that a British aircraft company may well feel pleased about. To fly that prototype four times in a few hours at the beginning of the week, to follow these with the first flight of yet another prototype and to bring the number of first flights in the week up to three by flying a re-engined version of an existing machine provides evidence that the constructors concerned are driving ahead and that their programme is well organized.

Congratulations then to British Executive Aircraft and General Aviation, Ltd., on their successful first flights with the Beagle 206 described in this issue, and getting the Beagle Auster 11 up to 20,000 ft. in its first flight and finding that the Rolls-Royce Continental-engined Airedale is performing well. Indeed both the other aircraft will be engined with Continentals by Rolls-Royce also. There is much in common between the installations of the B.206 and the Auster 11—more evidence of planning, perhaps foresight would be a better word. It is generally expected that the R.A.F. will order a version of the Beagle 206 as its Anson-replacement.

Meantime, with its A.R.B.-issued restricted C. of A. the Beagle 206 will be eagerly inspected at the S.B.A.C. Show. This executive aircraft, which provides three airliner seats in a row at the back and a bigger-than-airliner instrument board at the front of its cabin, is certain to attract much attention.

The Beagle pack is hot on the scent.

Towards Bi-sonicism

Appearance of the Handley Page 115 slim delta in the sky is certainly calculated to impress all with the unorthodox shapes to be expected when bi-sonic and tri-sonic airliners take the air. That day still seems pretty remote, so far as this country's products are concerned. The first important step was to be the flying of the Bristol 188, but structural problems encountered at the beginning in building an airframe of stainless steel then delays in the engine development programme have put back the expected first flight of this twin-engined machine many times. The wing of the Bristol 188 does not have the shape that a bi-sonic aircraft is now thought of having and for this reason the fact that the very slim Handley Page delta is actually in the air is an encouragement.

However, though it is not to be denied that the slow-speed performance, and particularly the slow-landing behaviour, of the slim delta is important, behaviour at Mach = 2 and higher speeds is the *raison d'être* for the craft. That such research is not the function of the H.P.115 is emphasized by its fixed undercarriage. All the more reason for pushing ahead with research such as that contemplated with the ogival-winged Fairey FD-2.

Research and development are the life-blood of production. They are vital for commercial supremacy. And we ought not to be satisfied until much more effort is put into the supersonic research programme.

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Matters of Moment

Busy Beagles

LAST WEEK was an eventful time for the very active Beagle Group, which saw no fewer than three of its development prototypes making their first flights. First, and most significant of these was that of the B.206 executive twin, which was flown initially at Shoreham on Aug. 15 by John Nicholson, flight operations manager of the Beagle Group and is described and illustrated on pp. 205-208 and 211.

Having been detail designed and built in just over nine months, the remarkable B.206 continued its very rapid development programme by completing four flights on its first day out, and carrying on during the following two days to complete more than nine hours' flying before going into the paint shop at Shoreham. In that time, it had spanned a range of flight speeds between the flaps-down stalling figure of 47 knots and more than 200 knots in level flight. About two and a half hours had been flown by an A.R.B. pilot for a Special Category C. of A., which was issued after one of the shortest times on record.

Initial flight reports of the B.206 have been particularly flattering, and the lateral control has been described by one of its pilots as the best ever encountered. The flight test programme is now being resumed, and the prototype B.206 will later be fitted out with its luxurious interior furnishings for five people, plus toilet accommodation.

On Friday morning, Aug. 18, the re-engined Beagle-Auster A.O.P. Mk. 11 first flew at Rearsby, in the hands of Mr. T. Howard, while in the afternoon the first Airedale with the 175 b.h.p. Continental engine (to be Rolls-Royce built) took the air after its conversion by Marshalls at Cambridge. The adaptation of the 260 b.h.p. Rolls-Royce/Continental IO-470 flat-six engine to the Auster Mk. 9, to produce the new Mk. 11, appears to have been a success, and an indication of the power reserve for tropical performance was soon given by a climb of the prototype last Sunday to 20,100 ft.

All three newcomers from the Beagle Group should be on display at Farnborough during the S.B.A.C. Show, together with the statically exhibited Lycoming-powered Airedale and the revised Beagle-Auster Terrier (see pp. 209-210).

The Specialists Meet

MEMBERS of the United States Institute of the Aerospace Sciences and the Canadian Aeronautical Institute come to London next month for their biennial meeting with the Royal Aeronautical Society. This takes the form of the Eighth Anglo-American Aeronautical Conference. Since 1947 members of the R.Ae.S. and I.A.S. have met at two-year intervals, either in England or the U.S.A., and in 1959 they were joined in their discussions by their Canadian counterparts.

The Conference begins on Sunday, Sept. 3, with a reception for the delegates and their wives given by the R.Ae.S. President, Air Marshal Sir Owen Jones, and the Society's Council. Then follows a week of visits by the overseas delegates to the aircraft industry and various research establishments. Two days, Sept. 5 and 6 have been set aside for visits to the S.B.A.C. Show at Farnborough.

Technical sessions, to be held in the Hamilton Place lecture theatre, will last four days, from Sept. 11 to 14. Fifteen papers (six British, two Canadian and seven United States), covering supersonic air transport, STOL and VTOL aircraft and satellites and space technology, will be presented and discussed. A list of titles appears below.

Although not part of the Conference, the 49th Wilbur Wright Memorial lecture will be given during the period—on Tuesday, Sept. 12. This year's lecturer is Dr. A. Silverstein, director of space flight programmes, NASA, who will speak on "Researches in Space Flight Technology."

Conference lectures to be given are:—

Sept. 11—Meteorological Measurements from the Tiros Satellites; On the Attitude Control of Earth Satellites; Upper Atmosphere Experiments with Particular Reference to Black Knight and Skylark; Communication Satellites.

Sept. 12—Ground Proximity Effects Associated with VTOL/STOL Aircraft; Some Considerations in Selecting VTOL Propulsion Systems; The Inverted Turbojet; Aerodynamic and Propulsion Considerations of Minimum-Field Aircraft; Wright Memorial Lecture.

Sept. 13—Transports of the Future—A Systems Approach; The Influence of Some Operational Problems on Supersonic Air Transport; The Supersonic Commercial Air Transport.

Sept. 14—General Aspects of Supersonic Transport Aircraft; On the Nature of Aerofoil Characteristics with a Sink Located in the Upper Surface (Comparison of Theory with some Fan-in-wing Experiments); Looking Ahead in VTOL/STOL; Control of VTOL Aircraft.

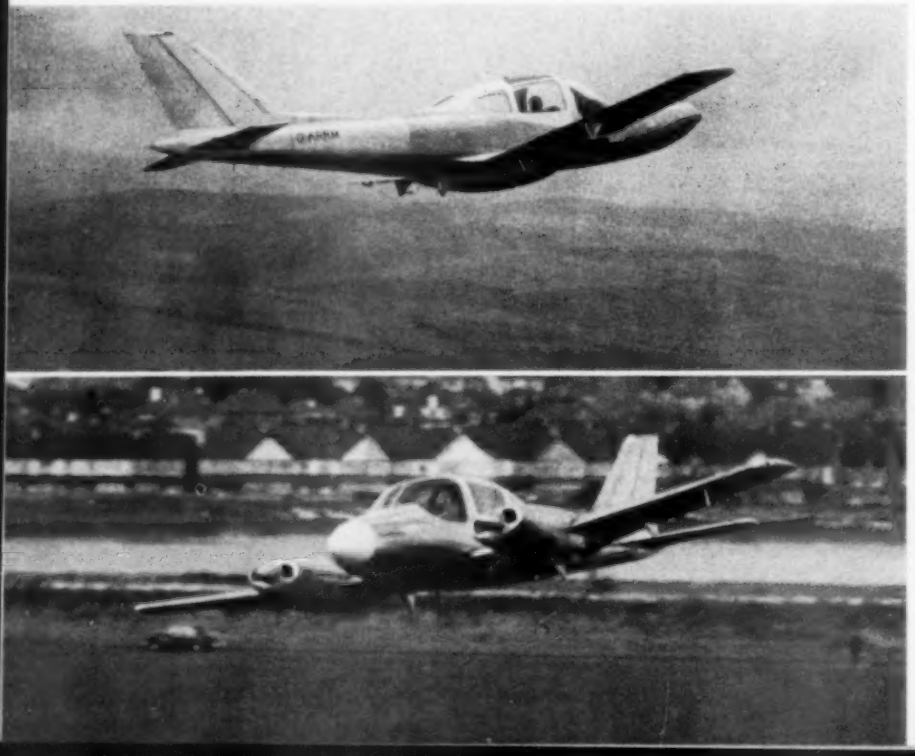
Who Designed the Vostok?

RUSSIA'S reluctance to be more forthcoming over certain aspects of her space programme is beginning to have repercussions. Apart from the weight this has given to the "don't believe they've done it" school, there are indications that it may have the effect of minimizing genuine achievement.

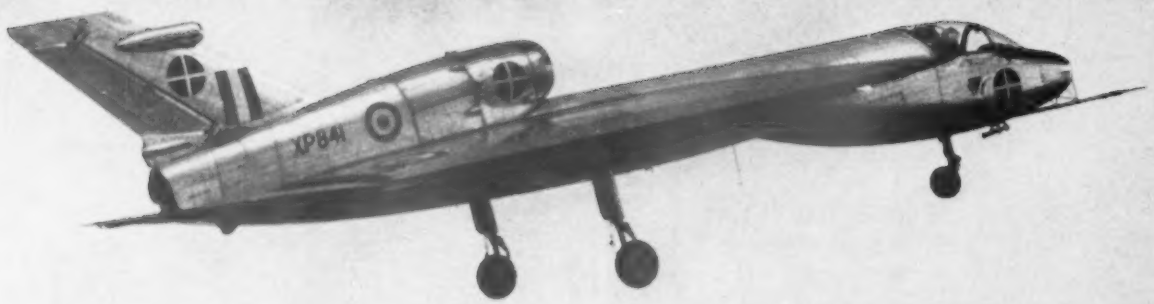
Take, for example, the life story of Major Gherman Titov which began in *Pravda* on Aug. 19. On the launching pad, Major Titov describes how he looked into the dark eyes of the chief designer of the Vostok and saw "fatherly love and care of a commander for my safe return." Yet nowhere is there a hint of this man's identity.

The fact that this kind of secrecy does not apply to leading Soviet aircraft designers, such as Ilyushin and Tupolev, has already led to reports that the rocket designer referred to may be of German origin, although, in fact, this is probably very wide of the mark.

In the same article, Major Titov makes a similar mystery of Soviet "cosmonaut" No. 3. He describes him as a bachelor



BEAGLE AIRBORNE.—First flight of the Beagle B.206X executive twin took place at Shoreham on Aug. 15, in the hands of John Nicholson. Taken on the same day these early flight views show the elegant lines of this new five/seven-seater.



FOR NARROW-DELTA RESEARCH.—The H.P. 115 made its first flight from the Royal Aircraft Establishment at Bedford on Aug. 17. It is seen here during the 31-minute flight in the hands of Sqn. Ldr. J. Henderson of the R.A.E. More pictures will be found on the next two pages, where the characteristics and purposes of this new research aircraft are also discussed.

"of surprising cold boldness" and of "iron self-control and courageous resolution." He said this unnamed man was with him at the launching site—already clad in a space suit—when he made his ascent in Vostok II.

Micro-burst at 1,000,000-lb. Thrust

A FIRST demonstration of the Rocketdyne F-1 rocket engine of 1.5m. lb. thrust was made at Edwards Air Force Base on Aug. 16, but it did not perform as expected. It burned for only one and a half seconds and then automatically shut down because of a minor fault in the propellent system. During this short time, however, it produced 1,000,000 lb. of thrust.

The National Aeronautics and Space Administration later reported that a faulty microswitch had indicated that a valve was closing when actually it was not. The automatic sensing equipment closed down the engine to protect it from possible destruction. It was only the second time in 19 static tests that "full operation has not been perfect." A photograph of the F-1 on test appears on page 199.

Balloon Satellite's First Year

ECHO I, the first passive communications satellite, completed a full year in orbit on Aug. 12. In that period, the 100-ft.-diameter aluminized Mylar plastic "balloon" had made 4,480 revolutions of the Earth and travelled more than 138 million miles.

The most significant of approximately 150 communications experiments performed with the satellite were, according to NASA: (a) a message by the President of the United States relayed during its first orbit; (b) the transmission of radio frequency energy between the United States and France; (c) the transmission of voice and music between the United States and England; (d) telephone conversations between the east and west coasts of the United States; and (e) the transmission of facsimile photographs and a letter by the U.S. Post Office Department.

Although the average reflected energy during recent experiments is about 40% less than it was immediately after the satellite was injected into orbit, satisfactory transmission of voice, teletype and facsimile communications is still possible. This indicates, however, that the "baloon satellite" has changed shape or become distorted.

Apart from its importance in radio communication experiments, Echo I has enabled other research teams to study "orbital behaviour theory." NASA emphasize that, because of its large size and relatively small mass, it is extremely sensitive to solar radiation pressures and aerodynamic drag. This causes the orbit to deviate from a circle to an ellipse.

When launched on Aug. 12, 1960, the orbit had an apogee of about 1,049 miles and a perigee of about 945 miles. Solar pressure forced the satellite toward the Earth until late in December when the perigee was approximately 580 miles and the apogee 1,350 miles. During the following months, solar pressure had the opposite effect, and in mid-June of this year the orbit became a circle approximately 960 miles above the Earth. The net loss in altitude was about 37 miles.

Now the cycle is being repeated and the orbit is returning to an ellipse. On Aug. 5 the apogee and perigee were respectively 1,093.6 and 827.2 miles.

Scientific studies have disclosed that intense solar activity—solar flares or storms—increase the atmospheric drag experienced by the satellite. The experiment has also shown that inflatable structures will survive for long periods of time in the space environment.

Echo I will re-enter the Earth's atmosphere and burn up during an orbital cycle when its perigee is nearer the Earth, but its lifetime is not exactly predictable. According to NASA, re-entry could occur "late this year or next summer." The satellite has been seen by millions of people throughout the World when it reflects sunlight from beyond the horizon during hours of darkness. It appears as a bright star of zero magnitude and is frequently visible from Gt. Britain without optical aid.

Anglo-European Air Freight

THE expected study of Anglo-European trade and air-freight prospects (see our issue of Jne. 29, p. 759) has now been published and we shall summarize the principal findings in a future issue.

This study—which examines relative distribution costs and times when using air and surface transport; estimates the traffic potential following reductions in freight rates; and discusses the effects of the use of specialized cargo aircraft—has been completed by Dr. K. R. Sealy and Mr. P. C. L. Herdson, of the London School of Economics, with the collaboration of Messrs. A. H. Stratford and J. F. R. Brown of the A.T.S. Company (Hawker Siddeley Aviation) who were acting for Sir W. G. Armstrong Whitworth Aircraft.

Broadly, the main conclusions are that overall reductions in air-freight rates of 40% and 50% could, given the right kind of equipment, lead to traffic increases of 120% and 220% respectively, and that such reductions could extend the competitive radius of air freight to cover almost the whole of industrial Europe. More than 5,000 representative consignments—mainly of machinery—were studied.

The study is obtainable from Hawker Siddeley Aviation, Ltd., Publicity Department, 32 Duke St., St. James's, London, S.W.1.

Late News

Overseas Aviation (C.I.), Ltd., has issued a writ against BP Trading, Ltd., claiming damages for alleged breach of contract to supply aviation fuel. Other news of this independent airline's difficulties will be found on pp. 199 and 202.

* * *

Although the U.S. Government has initialled a draft agreement providing for bilateral air services between New York and Moscow (see p. 215), the agreement will not be signed at present. The existing international situation was given as the reason for this Washington decision on Aug. 21.

* * *

South Africa is reported as likely to purchase Dassault Mirage IIIs and other weapons from France. Subject to Cabinet approval, the proposed Mirage order would allow modernization of the fighter squadrons now flying Sabre VIs and Vampire 5s.

* * *

The first appeal against a decision of the A.T.L.B. was heard on Aug. 21 and 22. It was by Falcon Airways, against the rejection of an inclusive tour licence application for Tangier, and against a time limitation on a similar licence to Malaga.

(Earlier news items will be found on pp. 199 and 215.)

World's First Slim-delta Research Aircraft

ON Aug. 17 the Handley Page H.P. 115 slim-delta research aircraft made its first flight at the Royal Aircraft Establishment, Bedford. Although designed for low-speed flight tests, this aircraft will play a very important part in any British supersonic airliner programme. It is the first aircraft which will give full-scale flight experience with a slim-delta wing of the type now accepted as the best planform for the Mach 2.2 airliner.

The H.P. 115 is one of two research aircraft which are being built following the work of the Supersonic Transport Aircraft Committee which was set up for joint research by Government establishments and the aircraft industry. Although this committee has now finished its work, it provided the basic information necessary for the development of a British SST. The committee's investigations showed the advantages of using a slim-delta wing and a thorough study of this type of wing was made. Results of the studies were described in a recent paper by Dr. D. Küchemann of the R.A.E. on "Aircraft Shapes and Their Aerodynamics for Flight at Supersonic Speeds."

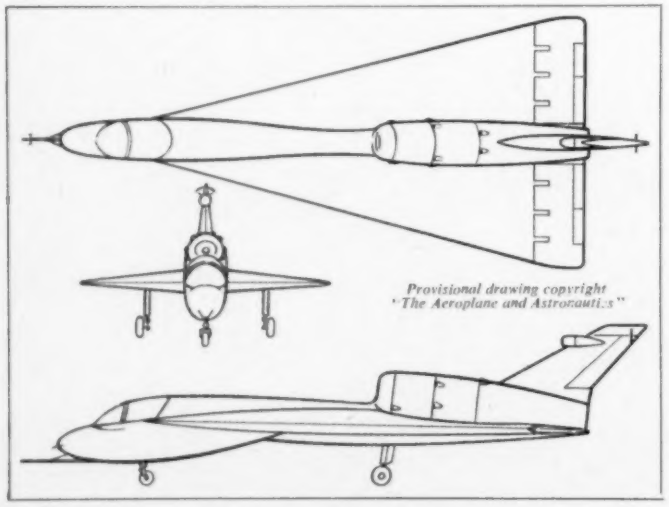
Despite a great deal of theoretical work and model tests, no full-scale flight experience is available with slim-delta wings and it was decided that two research aircraft would be needed to gain this experience and allow such problems as the stability, handling and control of slim-delta aircraft to be assessed by full-scale flight tests. As a result of this requirement the H.P. 115 has been built for low-speed trials and Bristol Aircraft are to modify a Fairey FD2 aircraft for high-speed trials.

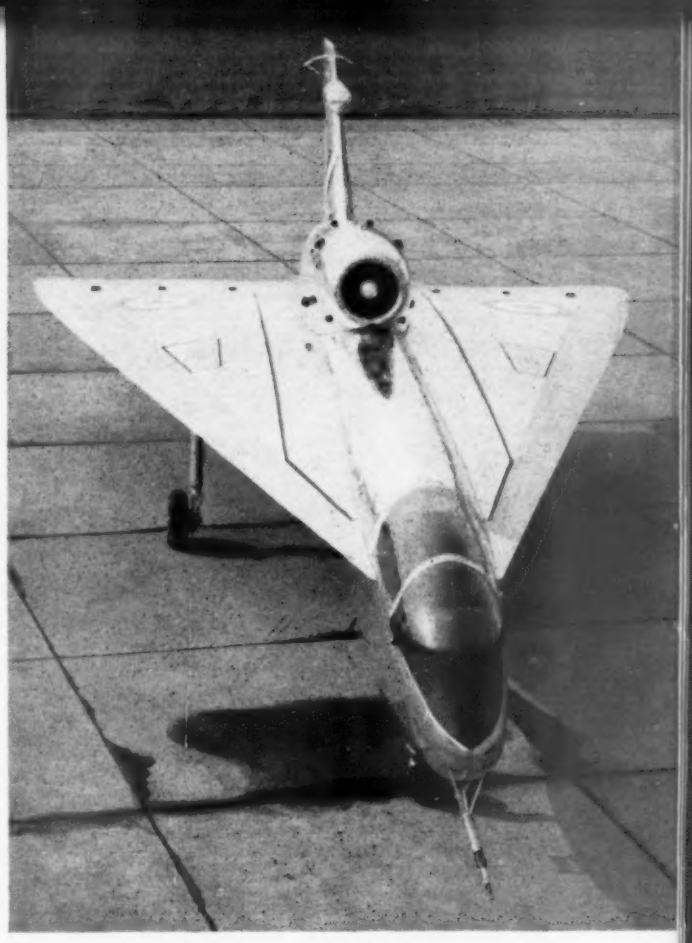
The first idea was that low-speed trials should be made with a glider, but studies by Handley Page soon showed that it would be much better to build a simple powered aircraft. At low speeds a slim-delta aircraft has a very high rate of sink; with a glider this would have meant that only a short time was available for tests during each flight and it would also have made difficulties for the pilot during the landing approach.

Photographs show that the H.P. 115 as now built is a small single-seat aircraft powered by a single Bristol Siddeley Viper turbojet which is mounted above its wing. This wing has streamwise tips and a leading-edge sweepback of about 75°. It appears to be of symmetrical bi-convex section. The engine nacelle is inclined, but the jetpipe is presumably kinked so that the thrust line passes through the centre of gravity.

It might be thought that the engine intake above the wing would be poorly placed for a good intake flow at high angles of incidence, but in practice the characteristic vortex flow over a slender wing provides an excellent air supply to the intake even when the aircraft is yawed.

The cockpit is in the nose of the aircraft ahead of the wing, but behind the nose the fuselage merges with the wing. The aircraft has a nosewheel tricycle undercarriage, probably with long-travel oleo legs; photographs show it to be non-retractable. Presumably the complication of a retracting undercarriage is unnecessary for a low-speed research aircraft of this type; the Short SB.5, for example, has a fixed undercarriage.





It apparently has elevon controls of considerable chord. The swept fin and rudder are mounted above the engine jetpipe. A large acorn fairing, mounted high on the fin, probably carries a camera to record the behaviour of wool tufts attached to the wing. Vented air brakes are evident in some of the photographs of the aircraft. Their position and shape can be seen in the picture on the opposite page.

The aircraft has obviously been designed to provide a simple and cheap research vehicle which could be produced quickly. In fact, it was originally planned to build the H.P. 115 in wood, but photographs show that it now has a metal airframe. But wing leading edges, for example, may have been built in wood so that for test purposes they could be rapidly replaced by leading edges of a different camber and/or planform.

Statements about the H.P. 115 suggest that only one aircraft has been built. If this is so, a structural test airframe is unlikely to have been built—which probably explains why a metal airframe was chosen. Metal construction would have made it simpler to meet the high strength factors likely to be built into the design of this novel airframe in the absence of structural test data.

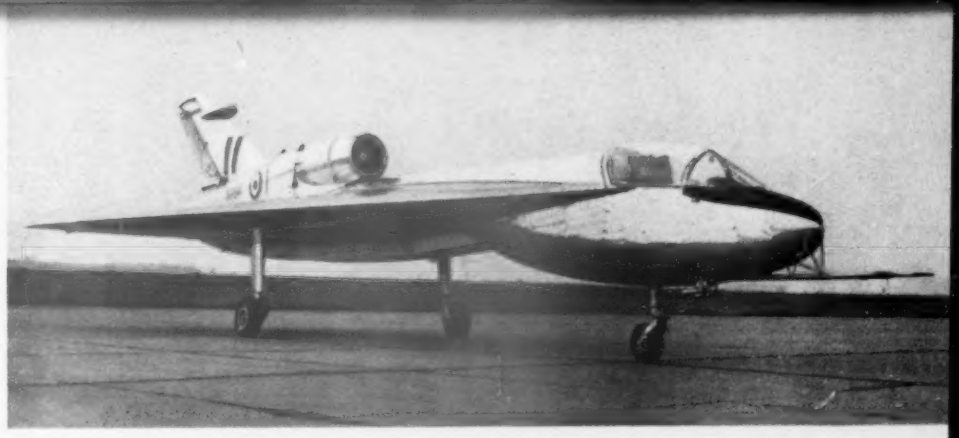
Because of its low operating speed, and to ensure systems simplicity, it is probable that the aircraft has manual rather than powered controls. Although these give a simple aircraft, they often involve a considerable amount of aerodynamic development to provide acceptable control loads and characteristics. Because of this the control system has probably been designed so that a range of variations can be made in tab characteristics.

Behaviour of the aircraft will be recorded on the test instrumentation which it carries, presumably in a fuselage bay. The only externally visible research equipment is the pitot probe carrying yaw and pitch vanes and the camera pod on the fin.

No official information has been given on the test programme for the aircraft apart from the statement that it will "comprise a study of handling characteristics, stability and control to be expected from very high-speed aircraft of this planform at the low speeds necessary during take-off, approach and landing."

In fact, the aircraft is about one-fifth of the linear size of

The shape of things to come? These general arrangement drawings—prepared from available information and photographs—show the layout of the H.P. 115.

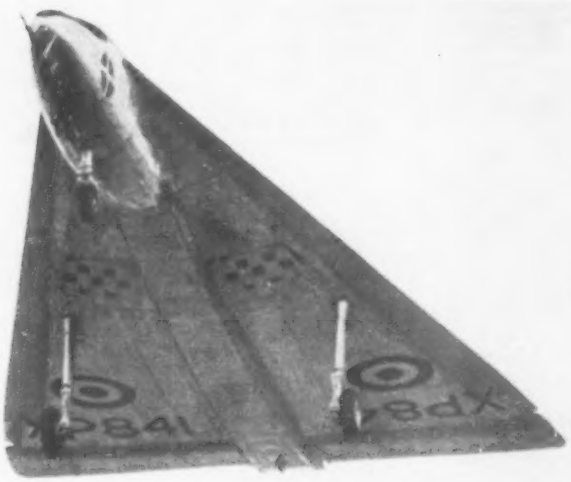


This view of the H.P. 115 shows the position of the intake for the Viper turbojet and of the pod in the fin which will presumably carry camera recording equipment.

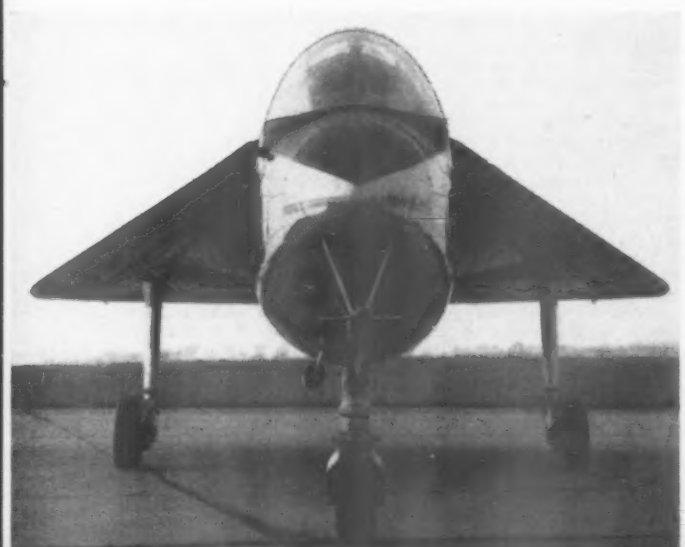
slim-delta supersonic projects such as the Bristol 198. This means that its rates of response and oscillation will be very high compared with a full-scale slim-delta airliner. Its rate of roll, for example, may well be up to five times that of a V-bomber.

Initial low-speed flying with the H.P. 115 will probably be done at heights up to 10,000 ft. so that its handling can be assessed before low-speed landings are attempted. Checks will be made on particular aspects of slim-delta wing behaviour which have been shown up in a free-flight rocket model and wind-tunnel tests. For example, at high angles of incidence a rapid but stable oscillation can be set up in which the aircraft moves quickly between about 60 degrees of bank in either direction.

Full-scale experience is also needed on the coupling between side-slip and roll. With slim-delta wings, high angles of roll are produced by a small degree of sideslip, and this characteristic could cause difficulties during cross-wind landings.



The picture above shows the vented airbrakes in the partially extended position and the full-span elevons. Below is a head-on view which shows details of the fixed undercarriage.



Most of the test programme will be carried out by the R.A.E.; it will probably take several years. Every aspect of take-off, landing and low-speed flight will be investigated. In addition, it is possible that ballast boxes in the wing and fuselage may be used to vary centre of gravity position and rolling inertia so that the effect of these variations can be studied.

Although the H.P. 115 is a small and simple aircraft, it ushers in a new phase in aerodynamics. As the first slim-delta aircraft to fly, it will introduce pilots to a type of wing which will probably become common in future. Perhaps its most unusual feature by accepted standards is that airflow at all flight stages separates from its leading and trailing edges. In other words, this form of wing is always stalled, and relies mainly on vortex lift.

The technical details given are: wingspan, 20 ft.; and length, 45 ft. The powerplant is one Bristol Siddeley Viper of 2,000 lb. thrust.

Synoptic Tiros Survey

A NINE-WEEK international exercise in the assimilation of global weather data from the Tiros III meteorological satellite began on Aug. 8. The results are broadcast promptly over international radio networks.

Announcing the programme, NASA stated that attempts would be made to photograph cloud cover over all areas which lie below the satellite's path. The orbit ranges between 48° north and 48° south of the Equator and includes China and some southerly parts of the Soviet Union. It is hoped to arrange for the satellite to take special photographs for any nation requesting them.

Tiros III was launched into orbit from Cape Canaveral on Jly. 12. It has already sent more than 6,000 photographs to receiving stations at the Pacific Missile Range in California and the NASA station at Wallops Island, Virginia.

The Changing Pattern of Industry

LAST Friday's news that some 1,500 persons—or about three-quarters of the labour force—at de Havilland's Portsmouth factory are to become redundant during the next 12 months is a sign of the effects of the changed pattern of the aircraft industry.

With the reduction of military work the need for sub-assembly capacity has been reduced and the Hawker Siddeley group, for one, is finding that this work can be more conveniently and cheaply done at the main production centres.

Machine-shop and tool-room work is still in demand and this will continue at Portsmouth; but the sub-assembly production for de Havilland will now be concentrated at the Hatfield and Chester factories. The second unit in what was the Airspeed division (previously the Airspeed company)—that at Christchurch, Hants—has a programme of production work on the Sea Vixen; this will continue for some time to come.

Maintenance at Gatwick

THE requirements of both British European Airways and British United Airways for land at Gatwick have, until recently, been in conflict. British United, which has already built a maintenance base at the airport, required additional land adjacent to it in order to expand; the land in question is held on lease from the M.o.A. by B.E.A., which had planned to use it also for a maintenance base.

A solution to this problem, which has been the cause of some bad feeling between the two operators, has now been found. Early in 1962, additional land which is at present owned by the War Office will be taken over by the Ministry, and incorporated into that part of the airport set aside as a maintenance area. B.E.A. has agreed in principle to take a new site including this land. The area to be relinquished by B.E.A. will be used in part to give B.U.A. the additional land it needs, and will also provide space in the maintenance area for two other companies.

OPtional Reading—8

ONE of the agencies of the industry which is least reported upon is ICAO. The focal point of World political life, the United Nations, will always command a headline in the World Press, but its elegant and not ineffective daughter, ICAO, not only rarely makes a national Press headline—it rarely makes a line in the Press of its own industry.

There have been exceptions: the great (?) Decca/VOR debates, the Assembly's demand for forward planning on supersonics (perhaps one or two others but I can't remember them)—these hit the headlines. But, generally speaking, these exceptions have had some emotional element in them and only by this have been deemed newsworthy. There is, of course, the ICAO Monthly Bulletin, which enjoys a very wide (and free) circulation. This certainly makes sure that all the ground is covered, but it suffers somewhat from being entirely unemotional, having been born in too respectable a society: the cut and thrust of debate, the intrigue and scandal of the coffee break, the press ganging of voters (for this see list of attendance at the Special COM/OPS/RAC Meeting on the short-range navigational aid)—these and all the spice of reporting are denied it. I propose, therefore, from time to time to take up the ICAO meetings, sensational and unsensational alike, and pass the odd comment on them; in a single column one can scarcely do more.

In this self-appointed rôle of picking up the unsensational and therefore unreported reports of ICAO meetings I have been glancing through the account of the Personnel Licensing and Medical session held last April. At this meeting the only item which might be called emotional was that concerning the recommendation for the compulsory retirement of pilots at the age of 60. I have not been surprised to find that this is the only aspect on which comment has been made in the general or the technical Press. But, as most pilots have had enough of it before 60 and as the recommendation may well be thrown out by the Council of ICAO (it passed the Division by only a 10 : 9 majority), it is probably the item least deserving of space. I propose, therefore, to pick up a few others.

Probably the most important result of this PEL/MED Meeting was the introduction of a definite requirement for the co-pilot (defined, for practical purposes, as the man in the right-hand seat) to have a rating on the particular type of aircraft being flown. No doubt many will think that, surely, this has always been the case. But no; in theory there was nothing to stop a Boeing 707 having, as second-in-command, a pilot with only a type and instrument rating on an Oxford. In practice, of course, most companies saw to it that their co-pilots had more than the minimum requirements: for example B.O.A.C. and B.E.A. have always insisted on the full Airline Transport Pilot's Licence for their co-pilots. However, on a World-wide basis, the practice with regard to co-pilot qualification varied from the full A.T.P.L. all the way down the scale—through systems of company (as distinct from state) type rating, company ratings for all phases except landing, ratings with and without a six-monthly check, right down to no type rating at all.

Assuming that the PEL/MED proposals are adopted by the Council of ICAO, a co-pilot will henceforward have to hold either a state-issued type rating or have "satisfactorily completed a course of approved training which will ensure a level of competency appropriate to his functions." All I would say about the latter is that I hope that "approved training" means "state approved" and that states taking this line will set up the required supervisory organization; the F.A.A., I gather, has just begun to do so.

Another whole bunch of proposals came from the meeting, recommending either a licence (state-issued) or a certificate of competency (company-issued) for the radar operator, the radio mechanic and the ground radio operator; additionally, the existing helicopter pilot's licence requirements were up-graded to Standards and will henceforward include private, commercial and airline transport categories, plus, for the first time, a state-specified instrument rating.

None of these will have any great impact on the day-to-day work of the larger operator or on the aeronautical responsibilities of the well-established state. For example, many states already issue radar ratings for approach and area control surveillance (it was always an ICAO Standard for GCA); many operators run their radio maintenance under the "approved organization" concept and remain unaffected by individual licence requirements; and some, probably most, states require a licence from a ground radio man to prevent him from cluttering up the ether with poor morse, voice or procedures. But not all of them. Some radar vectors on storm warning have betrayed an inadequate knowledge on the part of the controller of the limitations of his equipment; some states appear to have given a microphone to anybody who can say, "standby one;" some VOR transmitters have suffered serious installation errors, resulting in erroneous complaints of malfunction at the ground station.

The effect of this spate of licensing or "approving" should be in favour of reducing the shortcomings of a number of established authorities, though the "flexibility" built into all the requirements will mean that changes will not be revolutionary. But its greatest value lies in setting standards for the newly emergent aeronautical states: we have the Sudan, Nigeria, Ghana, Indonesia, Korea, Burma, Malaya, Thailand and a host of others, all with an indigenous aeronautical technology going back no further than a decade; the standard they follow will have an influence on the acceptability of air travel to the mass market almost no less than those of the older established interests. It is as well that ICAO has set these standards.

C.C.J.

Evidence from the Box

THESE are days of cynicism about previously accepted facts in the early history of aviation; doubts have been expressed even about the flights of the pioneering Cody. Perhaps this little narrative—the relevant parts of which are enlighteningly and charmingly, as well as aeronautically, naïve—may help to calm the minds of any doubters.

Some years ago I bought some china at a sale and, with intent to preserve its unsullied status quo during transit, I also bought a large tin trunk. This was a fine example of those stout hold-alls fashioned to resemble their leather equivalents and inseparable from the housemaid of long-lost yesterday, but with an enviable "coefficient of restitution." It cost 2s.; the auctioneer was getting tired and no one else shared my procurement policy of the moment.

On opening my prize I found that it contained just one complete newspaper and no more—the *Morning Post* of Dec. 9, 1909. Before even moving it I saw headlines on the front page which held my immediate attention:

MR. CODY'S TRIUMPH
66 Minutes in the Air
30 Miles Flight Across Country

This was news to startle the surface-bound public of 1909. "A magnificent cross-country aeroplane flight," the article began, "establishing a world record, was made by Mr. S. F. Cody, an entrant for the *Daily Mail* £10,000 prize for the first flight from London to Manchester, at Farnborough yesterday morning. He rose in the air at 6.3 a.m. flew for one hour and six minutes and covered a distance of 40 miles. During a quarter of this period he calculates he was over the unobstructed ground at Laffans Plain. For the rest of the flight he was traversing ideal 'across country' ground.

"This reckoning, vouched for by the observers and eye-witnesses at various points, gave him a world record for a flight of this description . . ." and so forth.

Subsequently in the article Mr. Cody is quoted, enlarging on his flight with some observations which might be of value to 707/DC-8 captains contemplating the London-New York sector.

"To test my engine," he is reported to have said, "I flew about over the Plain and I estimated I was 40-50 ft. high. I cut all sorts of fancy figures in the air. After a quarter of an hour of wheeling I steadily mounted in the air and my ear told me that my engine was working splendidly. . . ."

After half a column detailing his aerial cavortings, he continues: "The spire of a church hove up, I paused long enough to circle it. I turned to the right, passed over the dirigible shed once more and headed for . . . my garage.

"Just as I neared my shed my petrol gave out. . . ! I had used a little over five gallons."

Flight planners will note that the petrol should have given out 100 yards later. This, mark you, was the era of *accurate* flying—no landing with some 16 tons of spare fuel, as we find conventional today.

"As he descended from the aeroplane," the *Morning Post's* story continued, "Mr. Cody was enthusiastically cheered by a throng of soldiers and civilians. Numbed by the cold and splashed with oil, but triumphant [exactly as today's four-ringers but for 'oil' read 'coffee and condensation'], he called out, 'what's the matter with Cody's aeroplane now?'"

I still use and prize my tin trunk and retain its one content, the newspaper—from which I can quote to enlighten those in any doubt a half-century after its publication.—G. B. S. ERRINGTON.

Aviation News in General

CRANE WHIRLWIND.—Removal of a 3-cwt. transmitter from the bowl of the Jodrell Bank radio telescope, a task which would normally have taken 10-14 days, was accomplished in 4 min. on Aug. 15 by a Westland Whirlwind acting as a "skycrane." The transmitter, on loan from NASA, was used in the tracking of the solar probe, Pioneer V, launched 18 months ago. It is now to be reconditioned and used in the next series of operations of bouncing radar echoes off Venus.

CANADAIR FIRSTS. — The first flight of a CF-104 from Canadair's Montreal airfield was made on Aug. 14 when the third and fourth aircraft off the production line were airborne for the first time. Both reached Mach=2. The first and second Canadair-built aircraft were test flown from Lockheed's Palmdale facility.

SEAPLANE RECORD. — Moscow radio has claimed a new speed record for seaplanes of 664 m.p.h. The aircraft is believed to be the Beriev jet flying boat seen in the Moscow air display last month.

LUFTWAFFE STRENGTH.—Present operational wing strength of the Luftwaffe as assigned to NATO is one transport, one fighter-interceptor, four fighter-bomber and one fighter-reconnaissance. Working up to operational status are another transport wing, three fighter-interceptor, one fighter-bomber and two fighter-reconnaissance wings.

ANTI-SUB. VARIANTS.—Two new Gannet designations, AS.6 and AS.7, have been allocated to AS.4 aircraft which have been re-equipped with modified electronic gear. A flight of AS.6s is now operating from R.N.A.S. Culdrose.

ON TOUR.—A five-country European sales demonstration tour, embracing Germany, Sweden, Holland, Belgium and Switzerland, is to be made by the Canadair CL-41 *ab initio* jet trainer between the latter part of August and early October. It will be flown out to Frankfurt in a Seaboard World Airlines' CL-44 and will be reassembled there.

DEFENCE CO-ORDINATION. — Now in use with the U.S. Marines is a helicopter - transportable air defence control system developed by Hughes. This is designed to provide ground troops with defence against air attack by co-ordinating the firing of Hawk and Terrier SAM batteries. Each system is contained in five plastic and aluminium shelters known as "helihuts."

DORNIER POPULARITY. — The Dornier Do.27 in civilian guise is now flying in 25 countries as well as being used by the military forces of Germany, Switzerland, Belgium, Portugal, South Africa, Sweden and Spain. Fifty were licence-built in the last-named country.

MONOSPAR ATTEMPT. — Two Australians, Dr. John Morris and Mr. Bruce Harrison, are attempting to fly the 10,500-odd st. miles from Sydney to England in a General Aircraft Monospar, believed to be the only example of this type still in existence. After two false starts they left Sydney on Aug. 18 for the first leg to Brisbane.

UNITED EARNINGS.—A net income for the first six months of this year of $5,001,879, less than half that for the same period in 1960, has been declared by the United Aircraft Corporation. According to United, "the decline was primarily due to an adverse relationship of costs to selling prices on certain production contracts, both military and commercial."

NEXT WEEK

The greater part of next week's issue of THE AEROPLANE AND ASTRONAUTICS will be our annual pre-Farnborough survey of the British Aircraft Industry together with a stand-by-stand preview of the S.B.A.C. Show exhibits. This much-enlarged number, out next Thursday, will cost 2s. 6d.

L.A.P. GUIDE.—For the motorist the Royal Automobile Club has produced an informative pamphlet on the facilities available at London (Heathrow) Airport. Details of car parks, garages, hotels, restaurants, etc., at, and in the vicinity of, the airport, are given, as well as two maps, one showing the approaches to the airport and the other the north and central terminals. It is available free of charge from the Club or any R.A.C. county office.

COPYRIGHT.—Five of the photographs of Russian aeroplanes published in our issue for August 10 were the copyright of *Aviation Week*.

MEGA-POUND BOOST.—More than 1,000,000 lb. thrust has been developed by this "flyable" prototype of the Rocketdyne F-1 engine now on static test at Edwards A.F.B., Calif. A cluster of F-1 engines may help to launch America's first manned expedition to the Moon "before the end of the decade."

SATURN ARRIVES.—The first flight-weight prototype of the Saturn booster arrived at Cape Canaveral on Aug. 15 after a 2,200-mile barge journey from Huntsville, Alabama. Travelling with the Saturn was the dummy S-IV second stage. The dummy S-V third stage had arrived separately.

SUBMERSIBLE BOOSTER.—A successful underwater launching of a liquid-propellent Aerobee rocket was reported by Aerojet-General Corp. on Aug. 11. The firing was made from a flooded test basin at Azusa, Calif., and the company described the launch, and engine ignition while submerged, as the first achievement of its kind. The experiment was part of an investigation into the handling and launching of "heavy space boosters."

SWEDISH ROCKETRY. — Sweden launched the first of five Arcas research rockets from a test site at Vidsel on the Arctic Circle on Aug. 14. It released an artificial cloud at a height of 55 miles.

Commercial Aviation Affairs

FREIGHT RECORD.—K.L.M. is at present engaged in the largest single air freight charter ever arranged, calling for the airlift of 1,000 tons of insecticide from the U.S. and points in Europe to Cairo. Most of the insecticide—required to combat a pest disease attacking the Egyptian cotton crop—is being carried in DC-7F and L-1049H freighters but 45 tons has been flown across the Atlantic in DC-8s operating scheduled passenger services.

CHARTER "AIR-LIFT."—Plans for Derby Aviation to operate some inclusive tour flights in place of Overseas Aviation (C.I.) (see page 202) failed to materialize. Travel agents who had been relying on this arrangement for inbound and outbound passengers, made last-minute arrangements with other airlines and it is reported that all passengers who should have been flown by Overseas Aviation over the week-end were carried to their destinations without extra cost to themselves.

INDEPENDENT 7Cs.—Caledonian Airways (Prestwick), Ltd., have been completing negotiations for the acquisition of two DC-7Cs from an unnamed European long-haul carrier. Caledonian is due to become operational on Dec. 1 and will specialize in inclusive tour and group charter services.

TRANSCONTINENTAL FARES.—Excursion fares of $178 (piston) and $198 (jet), plus 10% Federal taxes, have been approved by the C.A.B. for T.W.A., American and United for transcontinental flights between various cities on the U.S. east and west coasts. The fares apply on flights in either direction which start between noon Monday and noon Friday, and the return portions must be made from 13 to 30 days after the start. American and United are reported to have opposed the new fares because they would divert traffic from existing coach-class services; they offered the new rates, however, to meet T.W.A. competition.

(*More news on page 215*)

Air Transport

Deep-penetration Ferry Approved

EIGHT days after the public hearing of the Channel Air Bridge application to operate vehicle-ferry services from Southend to Basle and Geneva (see our previous issue) the A.T.L.B.'s approval was announced. The terms of the licence allow the carriage of up to eight "supplementary" passengers, as well as those accompanying cars. Freight can also be carried.

Subject to approval from the Swiss Government, the service will begin next year, with Carvairs arranged to carry five or six cars, plus motorcycles and 23 passengers. Up to five flights a week will be operated to each destination.

Although Channel Air Bridge is not an IATA airline, it has decided to charge IATA passenger fares on the new services; this has avoided a clash with B.E.A. on the question of supplementary passengers. The passenger fares are probably higher than the company might otherwise have charged, but are "compensated" by low car rates—as low as £14 return for the smallest car to Basle. As we noted last week, the service will, in general, mean that it is cheaper to fly a car out than to hire one in Switzerland for holidays of a week or more.

Transatlantic U.A.A.

UNITED ARAB AIRLINES is now authorized to fly transatlantic services through London to any point in the U.S. This was one of the most important provisions of the Anglo-U.A.R. bilateral air services agreement initialled in Cairo on Aug. 4 and effective immediately. The agreement also provides for U.A.A. to serve Entebbe, Dar-es-Salaam, Nairobi, Aden, Hong Kong, Singapore and all British colonies.

Britain is allowed rights to Cairo from the U.K. and British colonies, and transit privileges through Cairo and Damascus to Pakistan, Afghanistan, Java, Tripoli, Port Sudan and Basra.

United Arab Airways is expected soon to announce an order for long-range jet aircraft suitable for transatlantic operation. Both the Boeing 707 Intercontinental and the Vickers VC10 are being considered. It was reported from the Middle East last week that a long-term £16-million loan is being discussed in Cairo between the British Aircraft Corporation and United Arab Airlines. This loan would be repayable over 12 years and U.A.R. products including cotton would be included in the settlement.

C.P.A. to London

CANADIAN PACIFIC AIRLINES will inaugurate services between Vancouver and London on Oct. 7, following approval by the Canadian Ministry of Transport. One service a week will be operated by DC-8 by way of Calgary, and one a week by Britannia 314 via Edmonton.

These services will compete with T.C.A. services, and the C.P.A. licence is a further stage of the Government policy to allow controlled competition for the state carrier on both domestic and international routes. Under the terms of the Air Services Agreement between the U.K. and Canada of Aug. 19, 1949, as amended in Sept., 1960, service between Vancouver and London is reserved to Canadian operators. Services between Vancouver or Edmonton and the U.K. must call at one other traffic point in Canada except by prior agreement.

Towards a Pan-Arab Airline

SHEIKH NAJIB ALAMUDDIN, chairman and managing director of Middle East Airlines, said last week that he would work towards achieving a single Lebanese airline (there are at present four) and then a Pan-Arab airline. All the documents separating M.E.A. from B.O.A.C. (which had held a 48.5% interest since 1955) were signed in London on Aug. 16 (see our previous issue). The Sheikh said that cash had been paid for the B.O.A.C.-held shares, but he declined to state the price; irrevocable letters of guarantee have been given in respect of loans totalling some £1,500,000, to be repaid over a number of years. M.E.A. also will continue to pay in regular instalments for the Viscounts and for Masco, the overhaul company in Beirut.

M.E.A., which originated the negotiations with B.O.A.C., wanted independence primarily in order to expand and to participate in national Arab affairs. The association with B.O.A.C., although valuable and cordial, had sometimes crippled M.E.A.'s planning, because the number of departments involved, and the necessity to obtain Government approval, made it impossible to obtain rapid decisions. The "invasion" of the Middle East by B.E.A., as we indicated last week, was also a sore point with M.E.A.

M.E.A.—which has purchased £19 million-worth of equipment and service in the U.K. since 1955—has been profitable, remarked the Sheikh, except in 1958, when there was a revolution in the Lebanon. [The B.O.A.C. Report and Accounts for 1960-61 show a loss in respect of M.E.A. for the year ended Mar. 31, 1961; M.E.A. accounts, however, are for the calendar year, and a profit of nearly £25,000 was made in 1960.]

Taking on the rôle of defender of the B.O.A.C. associate companies, Sheikh Alamuddin pointed out that the eight airlines in which B.O.A.C. had a non-controlling interest provided together a profit of £50,000 in 1960-61, while the five subsidiaries in which B.O.A.C. had a controlling interest had an aggregate loss of £1,820,000.

Technical and commercial links with B.O.A.C. will be retained, including the pool agreement for the U.K.-Lebanon route if this can be satisfactorily re-negotiated—"we now negotiate with B.O.A.C. on a commercial basis without the handicap of having borrowed money." Revenue on this route is at present shared on the basis of 62.5% to B.O.A.C. and 37.5% to M.E.A.; the revenue earned by M.E.A. has been above this percentage in recent months.

A Pan-Arab airline was not a national requirement but an economic requirement, said the Sheikh, to meet the challenge of turbojet aircraft and operating giants. A slow start was likely, with technical co-operation at first, then commercial co-operation and finally a complete merging of interests.

Footnote. As we go to press, it is learnt that the formation of International Arab Airways was a principal item on the agenda of the conference of Arab League civil aviation authorities, held in Bhamdoun from Aug. 15 to 22. Countries represented were the Lebanon, U.A.R., Kuwait, Jordan and Tunisia.

The following details of the M.E.A.-B.O.A.C. deal have also been received from the Lebanon: "The capital of M.E.A. is 6,250,000 Lebanese Pounds of which £L1,250,000 are shares owned by M.E.A. staff and employees (about 50% paid up). Of the basic capital of £L5,000,000, B.O.A.C.'s 48.43% share was £L2,420,000, which has been bought up for cash by Lebanese banking (Intra) and commercial interests.

"An agreement covering the taking over of B.O.A.C.'s other holdings was simultaneously agreed upon. It is expected that B.O.A.C. will get around £3,500,000 in payment for its holdings of land, hangars, buildings and some equipment (which continued to be owned by Masco after this totally owned B.O.A.C. subsidiary had sold most of its equipment to M.E.A. last year) as well as in repayment of loans advanced to M.E.A. by B.O.A.C. The sum of £3,500,000 includes the value of the shares."

B.E.A. is Squeezed

MOST operators might regard a 13.2% increase in traffic from one year to the next as satisfactory, but for B.E.A., which achieved just such a growth in June, it was "disappointing." The corporation had budgeted for a 21% increase, and the average monthly load factor declined, in consequence, by four points. A more serious situation is shown by the preliminary results for July, with a 9% traffic increase and a fall of six points in load factor. At the present scale of operations, one point of load factor represents about £750,000 of revenue per year.

Discussing these results in the current edition of the *B.E.A. Magazine*, Lord Douglas attributes the slowing down in air traffic growth to the present state of Britain's economy as well as to the drop in U.S. visitors to Europe. He also gives some interesting figures for the effect on B.E.A. of recent Government measures. Thus, increased telephone charges and fuel and other taxes will cost more than £30,000 in the current year, while increased landing charges and other Government-imposed cost increases represent more than £550,000 in the year. If the new Bank Rate is followed by an increase in interest rates payable by B.E.A. on its Treasury loans, this would cost as much as £200,000 a year, while the employment tax, if imposed, would cost another £140,000 a year.

To combat "this difficult situation" B.E.A. is keeping a strict watch on expenditure and has temporarily imposed a "freeze" on staff numbers.

Hushing it up at L.A.P.

NEW procedures to reduce jet aircraft noise over large communities west of London (Heathrow) Airport were introduced on an experimental basis on Aug. 21. These procedures comprise specified routeings away from the airport for aircraft departing from the runways (28R, 28L and 10R) from which most turbojet take-offs are made. The routeings are compatible with normal A.T.C. requirements and are supplementary to the noise abatement take-off techniques already applicable.

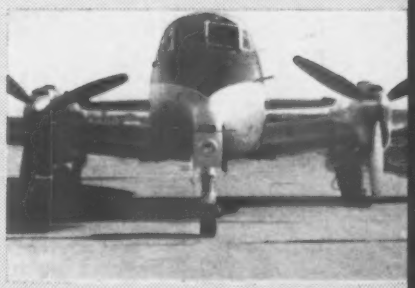
As an additional means of providing relief from aircraft landing noise, runway 28L is designated for preferential use for landing when a westerly traffic flow is in operation, and runway 28R is therefore preferential for take-off in these circumstances.

GNOME

GYRON JUNIOR

SPECTRE

GIPSY



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Air Transport . . . .

B.E.A. in 1960/61

PUBLISHED two days ago, the British European Airways Report and Accounts for 1960/61 is the usual comprehensive document, setting on record the Corporation's affairs in great detail. The financial result, as already noted, was not unsatisfactory, with a profit of just over £1¼ million after payment of interest charges. This compared with a profit of just over £2 million in 1959/60—which was B.E.A.'s best-ever result.

The tabulated results on this page show the salient features for 1960/61, with a big increase in traffic—but not quite big enough to match the greater capacity offered. Compared with other European carriers, the B.E.A. figures are a little above average, but the report warns of difficulties ahead as a result of growing competition from foreign carriers as well as the threat of competition from British independents. Some extracts on this and other subjects follow:

The Future

Uncertainty resulting from new licensing procedures, says the report, makes the planning of future B.E.A. operations difficult. Forecasts of traffic growth, though still valid, cannot be used with the same confidence as hitherto as the basis for large new capital commitments. Applications from other airlines for rights in parallel with B.E.A. on existing routes represent, in total, a passenger operation with revenue-earning potential of over £7 million—or about 14% of B.E.A.'s estimated total revenue—in 1965/66. The introduction of competitive operations of this magnitude would inevitably cause B.E.A. to make downward revisions in its future plans.

The most important factor behind B.E.A.'s high rate of traffic growth in 1960/61 was, says the report, the reduction in more than 400 fares made last year. "Rapid expansion of air transport has depended, and must continue to depend, on progressively lowering the level of air fares. To achieve this, and yet remain profitable, airlines must continue to reduce the unit cost level of services operated and must also maintain a high average load factor. We hope that the A.T.L.B. will always keep this point clearly in view. Duplicating airline services on routes on which there is not sufficient traffic to warrant this will inevitably lead to higher operating costs and lower load factors and thus prejudice the possibility of offering lower fares to the public, and hence retard the rate of air traffic growth."

B.E.A. RESULTS SUMMARIZED

	1960–61	1959–60	Percentage variation
Finance	£	£	%
Traffic Revenue	40,728,105	35,209,785	+15.7
Total Revenue	42,270,467	36,549,529	+15.7
Expenditure on operating account	39,606,751	33,383,678	+18.6
Total expenditure	40,725,146	34,463,451	+18.2
Profit before charging interest on capital	2,835,384	3,239,084	−12.5
Profit	1,543,321	2,086,078	−25.9
Traffic			
Capacity ton-miles offered	237,395,520	191,992,307	+23.6
Load ton-miles sold	154,772,355	130,032,466	+19.0
Revenue load factor	65.2%	67.7%	− 3.7
Load factor needed to cover total costs	62.8%	63.8%	− 1.6
Cost per c.t.m.	41.2d.	43.1d.	− 4.4
Revenue per c.t.m.	42.7d.	45.7d.	− 6.6
Revenue per l.t.m.	65.6d.	67.5d.	− 2.8
Passengers carried;	3,990,957	3,289,606	+21.3
Revenue passenger miles	1,393,364,205	1,153,784,735	+20.8
Available seat miles	2,088,893,804	1,662,756,681	+25.6
Passenger load factor	66.7%	69.4%	− 3.9
Mail carried—tons	8,350	7,848	+12.8
Mail ton-miles	4,215,066	4,001,082	+ 5.3
Freight carried—tons	41,996	36,395	+15.4
Freight ton-miles	16,601,189	14,893,914	+11.5
Operations			
Regularity (passenger ops.)	97.2%	97.5%	− 0.3
Punctuality (passenger ops.)	77.8%	83.3%	− 6.6
Line aircraft—average	99.3	109.5	− 9.3
Revenue hours flown	195,725	193,790	+ 1.0
*Revenue utilization—hours per year	1,990	1,858	+ 7.1
*Cost per revenue flying hour	£208.1	£177.8	+17.0
*Revenue per revenue flying hour	£216.0	£188.6	+14.6
Aircraft miles flown	40,150,667	37,365,967	+ 7.5
*Cost per revenue mile flown	243.4d.	221.4d.	+ 9.9
*Revenue per revenue mile flown	252.7d.	234.8d.	+ 7.6
Personnel			
Average number of employees	13,240	12,190	+ 8.6
C.t.m. per employee	17,930	15,750	+13.8
Revenue per employee	£3,193	£2,998	+ 6.5

* Excluding helicopters.

Points from the Report

B.E.A.'s rate of traffic expansion was well above the World airline average.

Eight per cent. return on capital and reserves actively employed in B.E.A. operations (before payment of 4.8% interest charge on capital employed).

Number of passengers carried by B.E.A. was exceeded by only four other airlines in the World.

B.E.A. carried a quarter of all scheduled air traffic within Europe.

The actual increase in traffic carried in 1960/61—nearly 25 million l.t.m.—was the biggest ever achieved by B.E.A., and equalled the airline's entire annual traffic 10 years ago.

The air share of total traffic between the U.K. and the Continent rose to 47% in 1960/61. B.E.A. carried 54% of normal scheduled traffic on the routes it serves and 46% of all normal scheduled air traffic in and out of the U.K.

B.E.A. fleet at end of the 1960/61 year numbered 95 aircraft—10 fewer than the year before, but average speed of all operations increased by 6% to 205 m.p.h. and average seating capacity by 17% to 56.2 per aircraft.

Overall annual utilization rose by 7% to 1,990 hours. Viscount 806 fleet utilization, at 2,578 hours per aircraft, set a new B.E.A. record.

The six Vanguards delivered to B.E.A. in 1960/61 are being amortized by seven annual instalments calculated to reduce the cost to the realizable value of the aircraft.

The Helicopter Experimental Unit flew 1,465 hr. with two Whirlwinds, one Sycamore, a Bell 47B and a Bell 47J.

Outstanding capital commitments at Mar. 31, 1961, included: £31,700,000 for Trident fleet; £12,600,000 for Vanguard fleet; £5,200,000 for Comet fleet; £3,300,000 for other aircraft; and £6,200,000 for premises, including the West London Air Terminal.

Another aspect of the problem is also stressed by B.E.A. thus: "B.E.A. is recognized as one of a small group of the World's innovating airlines; that is to say, those airlines which have the technical equipment, resources and manpower to initiate and bring to fruition entirely new aircraft projects. The Corporation's current preoccupation in this field is the development and introduction of the D.H. Trident.

"The 24 aircraft of this type which B.E.A. now has on order would have met our previously foreseen traffic demands up to the summer of 1965. Beyond that date we had previously foreseen a requirement for additional aircraft and we had hoped to have been able to meet this requirement by ordering a developed version of the Trident with larger seating capacity and consequently lower seat-mile costs. But it is obvious that decisions of this kind cannot be made at the present time; far from knowing that we have a requirement for more developed Tridents in 1966 we cannot currently feel sure that the aircraft we already have on order will actually be required in the years ahead."

In addition to the Tridents, B.E.A. at present has on order three Argosy freighters and three Heralds for introduction in 1961/62; the latter are to be used on Scottish routes under an arrangement with the M.o.A. to obtain commercial airline operating experience for the aircraft. Possible replacements for the D.H.89 have been kept under review and cost and performance assessments of three different multi-engined helicopters for interim use have been made. B.E.A. still believes that the Rotodyne is the only helicopter in the World "which holds promise of being able to operate commercially self-sufficient scheduled services."

Financial results for the first four months of 1961/62 are "causing some concern." Traffic from the U.S. to Europe has hardly increased at all over the previous year's level, but the capacity offered by European airlines has increased by more than 25%, thus intensifying the already fierce competition on B.E.A.'s international routes.

B.E.A.'s policy of commercial co-operation with foreign airlines flying in parallel is described as aiming to obtain "the

Air Transport . . . .

full benefits of the best possible spread of service timings, the rationalization of capacity, economic load factors, and hence the maximum opportunity to reduce fares." Pooling agreements are framed, "whenever possible, in ways which leave a measure of competitive stimulus. In other cases they were designed to overcome the restrictive conditions of the intergovernmental Air Services Agreements which would otherwise limit the capacity provided."

In the course of the year new long-term agreements have been signed with S.A.S.; with Alitalia; with the Republic of Cyprus for operations on behalf of Cyprus Airways for the next five years in the Eastern Mediterranean and the Middle East; with Gibraltar Airways for continuation of the Gibraltar-Tangier service; with the Malta Government for continuation of the existing association for the next 10 years; and with T.A.P., extending previous arrangements in time and scope. New operations, such as the service to Budapest, have been brought into the pool network.

B.E.A.'s interest in its various associated companies remained substantially unchanged during the year and none recorded losses in which B.E.A. needed to participate. Since the end of the 1960/61 year, financial interest in Alitalia has been terminated. The associated operating companies now, therefore, comprise Aer Lingus, Cambrian Airways, Cyprus Airways, Gibraltar Airways, Jersey Airlines and Malta Airways.

Finance

Profit for 1960/61 added to accumulated balance from previous years made a total of £2,364,734 available for appropriation. This has been used as follows: £1 million to the insurance reserve, to give a total of £2,574,428; £1,200,000 to development reserve, making £2,200,000; £118,468 in respect of capital loss on realization of shares in Alitalia; £46,266, balance carried forward.

Traffic revenue was derived in these proportions: passenger services, 84.1%; mail, 4.0%; freight, 6.9%; and charters, 1.4%. The remaining 3.6% of total revenue came from commissions and incidental items. International services contributed 76.2% to the traffic revenue, and domestic services contributed 23.8%. In round figures, international services made a profit of £2,200,000 and domestic services a loss of £700,000.

Lower fares led to a 3.5% reduction in the average passenger revenue rate, with a fall from 6.63d. to 6.44d. per passenger-mile in the average international rate, and a fall from 5.45d. to 5.22d. in the average domestic rate.

At Mar. 31, 1961, B.E.A.'s operating equipment and property, including aircraft under construction, had a book value of £63,176,746, and the value of investments in subsidiary companies, etc., was £5,329,541.

Independent Difficulties

LAST week's news (see our previous issue, page 169), that Overseas Aviation (C.I.), Ltd., was seeking voluntary liquidation, inevitably focused attention once again on the status of British independent airlines. To the outsider it must seem extraordinary that an airline owning or operating a fleet of 40 aircraft, holder of a Ministry of Aviation Air Operator's Certificate and a number of Air Service Licences for scheduled and charter flights, and only recently accepted as a full member of BIATA, should thus be found wanting. The event reopens the question of regulating participation by independent companies in major air transport operations. It had been thought that the new legislation introduced last year, under the Civil Aviation (Licensing) Act, 1960, would effect adequate control; this now seems less certain.

There is no suggestion that Overseas Aviation (C.I.) has been operating unsafely; this aspect is covered by the Air Operator's Certificate. The 1960 Act also requires, however, that the financial stability of an operator should be assured before an Air Service Licence is issued, and this is the responsibility of the Air Transport Licensing Board. In the course of Public Hearing 21, on Aug. 1, Prof. Jack, the Board's chairman, made it quite clear that this point was being considered. Mr. Ronald Myhill, chairman and managing director of Overseas, was asked by Mr. Marking (for B.E.A.) about his company's indebtedness to British Petroleum, Rolls-Royce, its insurers and B.O.A.C. When Mr. Myhill declined to answer, Prof. Jack said that the Board had already asked Overseas Aviation (C.I.) for certain details of its financial arrangements and that the reply would be carefully considered.

Most of Overseas Aviation's flights this year, both scheduled and inclusive tour, have been made under transitional licences, which were issued automatically to holders of licences approved by the Ministry before the 1960 Act came into effect. A number of B- and C-class licences had, however, been granted to Overseas by the A.T.L.B. in the past few months.

Overseas Aviation (C.I.), Ltd., as we recorded last week, owns no aeroplanes at the present time. The company, registered in Jersey in 1958, started operations with a single Viking and later acquired two more. As the fleet grew, according to Mr. Myhill, difficulty was encountered in keeping up the hire-purchase payments, and a holding company, Overseas Aviation, Ltd., was formed to take possession of all the aircraft. The latter company now owns a fleet of 40 aircraft, including a number on which repayments are still being made. These aircraft have been used under charter by Overseas Aviation (C.I.).

When Overseas Aviation (C.I.) went into liquidation—whether this action was, in legal interpretation, voluntary or compulsory is not at present clear—some 5,000 passengers were in Europe with their return flights booked on Overseas services. Responsibility for arranging the return of these passengers—almost without exception on inclusive tours—rests with the travel agents who had chartered the aircraft, and the offers of B.E.A., Cunard Eagle, Aer Lingus and other operators to fly them back on scheduled services naturally met with little response. Most agencies with bookings with Overseas Aviation (C.I.) said last week that alternative arrangements had been, or were being, made for the return of all passengers, and for all future tours to take place as planned. Many agents seem likely to lose money as a result of the rearrangement, because Overseas' prices were very low, but passengers are not expected to suffer.

Arrangements were being made last week for Derby Aviation to assume responsibility for the operation of some flights by Overseas Aviation Argonauts and crews—particularly to cover commitments over last week-end and for the remainder of the holiday season. The M.o.A. agreed to endorse Derby Aviation's Air Operator's Certificate for this operation on the basis of Overseas Aviation (C.I.)'s operational arrangements remaining completely undisturbed.

On Aug. 16, 200 employees of Overseas Aviation (C.I.) were given notice, including a number of pilots. Some were expected to be re-employed under the terms of the arrangements with Derby Aviation.

LOGAIR ARGOSY.—Photographed at Tinker Air Force Base, this Armstrong Whitworth Argosy is one of the seven used by Riddle Airlines for the Logair scheduled cargo service. One load is seen being removed through the nose doors while another is rolled into the aircraft from the rear.

Air Transport . . . .

T.W.A. Seeks Freedom

THERE is a "dirty-linen-washed-in-public" air about the legal action taken by T.W.A. in a bid to divest itself forever of interference from Howard Hughes. The action takes the form of a suit for damages for alleged anti-trust violations; this suit was filed in the U.S. District Court in New York on Jne. 30 and the preliminary hearing was held on Aug. 8.

The defendants are Howard Hughes in person; the Hughes Tool Co. and Raymond M. Holliday, the Hughes representative on the three-man voting trusteeship which was set up for the 78% Hughes' holding in T.W.A. at the end of last year (see our issue for Dec. 30). The Atlas Corporation (in which Hughes has an 11% interest) and Northeast Airlines (58% owned by Atlas) are named as co-conspirators.

T.W.A. seeks damages totalling $115 million, plus such punitive and exemplary damages as the court might decide, and rulings which would permanently divest the defendants of all interest in T.W.A. stock, and would prevent attempts by them to exercise any influence or control over T.W.A. affairs.

The Hughes Tool Co. has asked that the T.W.A. suit should be dismissed on the grounds that all the arrangements and actions complained of were approved by the C.A.B.

The T.W.A. complaint, as filed in the District Court, throws new light on its re-equipment difficulties since 1955. In that year, Hughes—described by his own counsel as "an eccentric"—agreed with General Dynamics to develop the Convair Model 18 jet transport, for use by T.W.A. This plan was followed in 1956 by another for Hughes Tool to manufacture an aircraft called the Golden Arrow. Meanwhile, T.W.A.'s competitors were ordering other jet transports, but T.W.A. was not allowed to do so. Eventually, Hughes Tool ordered 33 Boeing 707s, and then resumed negotiations with General Dynamics, leading in due course to the order for 30 Convair 880s. T.W.A. was subsequently unable to arrange for design modifications to be made to the 880.

In June, 1959, six of the Boeing 707s were sold by Hughes to Pan American. The remainder were leased on a daily basis to T.W.A., which was prevented by the terms of the lease from dealing with other aircraft manufacturers.

In 1960, Hughes encouraged the proposal that Northeast should merge with T.W.A. The terms, T.W.A. alleges, were advantageous to Northeast but not to T.W.A.; they would have served to enlarge T.W.A.'s requirements for aircraft, which only Hughes could supply, and would have allowed Atlas to obtain T.W.A. stock on advantageous terms. In November, 1960, Hughes released six Convair 880s to Northeast, including three which had been previously assigned to T.W.A.

Obstruction by Hughes delayed the T.W.A. financing programme which eventually got under way at the end of 1960, with the result that the airline had to pay 6¼% instead of 4¼% interest and lost the chance to sell surplus piston aircraft, T.W.A. alleges. Since the voting trust was set up, T.W.A. has negotiated orders for 30 more Boeing 707s and 720s (see our issues for May 4 and May 11), for which a loan of $147 million was negotiated.

After this deal had been announced, Hughes, it is alleged, warned T.W.A. that it might be under legal obligation to purchase 13 Convair 990s which had been ordered by Hughes Tool; threatened suits against T.W.A. in telegrams and messages to the airline, the directors, voting trustees and financial institutions; and warned Boeing that its contract with T.W.A. was not binding. As a result, at least one of the proposed lenders withdrew completely and T.W.A. was "handicapped" in obtaining finance for this order and for additional jet transports which it needs.

North Atlantic Traffic

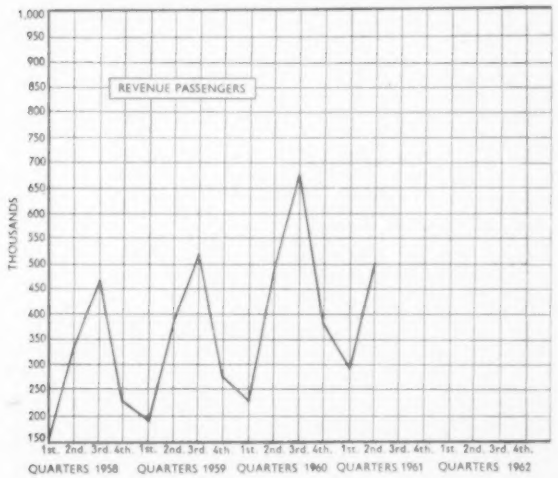
THE IATA statistics for North Atlantic traffic in the second quarter of 1961 confirm the situation already plaintively proclaimed by the airlines—a massive increase in capacity coinciding with a recession in the anticipated traffic growth. New equipment and new carriers on the route combined to increase the available seats in the quarter by 47.3% over the same quarter of 1960—an increase which in any case was far in excess of the most optimistic forecast traffic growth.

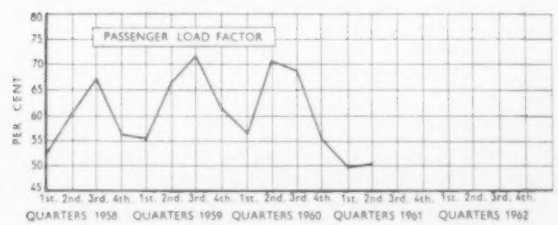
In fact, the number of passengers carried in the quarter, 500,277, was only 4.5% above the equivalent 1960 figure, whereas the average rate of growth over the whole of 1960 was 28.8%. An interesting feature of the second quarter statistics is that the number of passenger flights increased by more than 16%, despite the use of larger aircraft; in the second quarter of 1960 a 20% increase in capacity was achieved with 6.7% fewer flights than the 1959 figures.

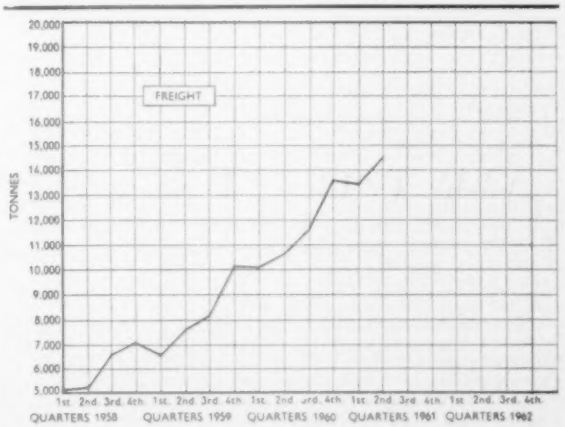
For the first half of 1961, Atlantic traffic has been 12.3% above the first-half 1960 figure. The second quarter statistics, excluding charters, are tabulated below.

SECOND QUARTER 1961

	Eastbound	Westbound	Total	Change over 1960
Scheduled passenger flights	4,009	4,020	8,029	+ 18.0%
Scheduled cargo flights	556	498	1,054	
Seats offered:				
First	88,237	88,510	176,747	
Economy	408,772	409,470	818,242	
Total	497,009	497,980	994,989	+ 47.3%
Revenue passengers				
First	39,400	32,877	72,277	
Economy	249,956	178,044	428,000	
Total	289,356	210,921	500,277	+ 4.5%
Passenger load factor (%)				
First	—	—	40.9	
Economy	—	—	52.3	
Total	—	—	50.3	— 20.6
Freight (kg.)	4,269,820	3,727,673	7,997,493	+ 35.2%
Passenger flights	3,855,020	2,562,579	6,417,599	
Cargo flights	2,851,132	1,748,234	4,599,366	+ 38.4%
Mail (kg.)				







The Fighting Services

Flag Officer Aircraft Carriers

REAR ADMIRAL F. H. E. HOPKINS, C.B., D.S.O., D.S.C., R.N., is to become Flag Officer, Aircraft Carriers, in January of next year in succession to Rear Admiral R. M. Smeeton, C.B., M.B.E., R.N.

Qualifying as an observer at R.N.A.S. Lee-on-Solent in 1934, Rear Admiral Hopkins took command of No. 830 Squadron, equipped with Swordfish, in December, 1941. From 1942 to 1944 he was with the British Naval Air Mission in Washington and then joined the American Fast Carrier Task Force.

During the War he cross-trained as a pilot and in 1945 completed the fighter course at the School of Naval Air Warfare. Appointed Commander (Air) in H.M.S. "Theseus" in 1950, he was Deputy Director of Air Organization and Training from 1951 to 1953. In 1956 he assumed command of H.M.S. "Ark Royal," and has been Flag Officer Flying Training since September, 1960.

SHAPE Association Proposed

THIS year marks the tenth anniversary of the Supreme Headquarters Allied Powers Europe. During this period a considerable number of officers from the Services of the NATO countries have served in these headquarters and to keep alive their past association with the organization it has been proposed to form a SHAPE Association.

The Supreme Commander, General Norstad, U.S.A.F., has given his approval to this suggestion and has agreed to address the initial meeting. Gen. Gruenther and Gen. Schuyler, as well as other former senior officers, have received the idea with enthusiasm and have agreed to be present at the inauguration of the Association on Saturday, Oct. 7.

There will be a dinner at 20.00 hrs. in the new SHAPE dining room, preceded by cocktails in the lounge from 18.30 hrs. Dress uniform or black tie will be worn. The cost of the dinner, including cocktails, will be NF30.00. If necessary, transportation to SHAPE will be provided from Paris. Reservations must be made with Col. E. L. Robbins, U.S.A.F. (Retd.), 37 Avenue Pierre 1er de Serbie, Paris 8, before the beginning of October.

R.A.F. Medical Changes

AIR COMMODORE J. B. WALLACE, O.B.E., M.D., Ch.B., has become Deputy Director-General of Medical Services with the acting rank of Air Vice-Marshal, in succession to Air Vice-Marshal G. A. M. Knight, C.B., C.B.E., Q.H.S., M.B., B.S., D.L.O., who is retiring.

Previously Principal Medical Officer, Near East Air Force (Cyprus), Air Cdre. Wallace joined the R.A.F. in 1935. In January, 1950, he became Deputy Principal Medical Officer, Coastal Command. He served as Deputy Principal Medical Officer, Home Command; from September, 1958, until going to Cyprus, he was Principal Medical Officer, Fighter Command.

Gp. Capt. J. C. Taylor, O.B.E., B.Sc., M.B., Ch.B., D.P.H., D.I.H., has gone to Cyprus as P.M.O., Near East Air Forces, with the acting rank of Air Commodore. Since 1949 Gp. Capt. Taylor has spent two years on an exchange medical posting with the R.A.A.F., and been S.M.O. with both the Combined Selection Centre at Hornchurch and No. 40 Group. Following two years with the British Forces, Arabian Peninsula, he was successively on No. 1 Central Medical Board, and at the R.A.F. Institute of Aviation Medicine before taking up liaison duties with the Ministry of Aviation.

The R.A.F. At Farnborough

THE Royal Air Force is providing a 30-minute contribution to the flying display at the Farnborough S.B.A.C. show.

The main item is to be a large-scale demonstration of tactical transport operations by No. 38 Group, Transport Command (Air Vice-Marshal P. C. Wykeham). This event will begin with a simulated attack on the control tower by eight Hunter FGA.9s No. 54 Squadron (Sqn. Ldr. W. D. Dickinson) from R.A.F. Stradishall, after which they will maintain a combat air patrol throughout the rest of this item. The next part will be a landing of an assault party by six Whirlwinds and Belvederes; the troops will be roped down in front of the President's tent.

After the departure of the helicopters there will be a landing of troops and vehicles by Beverleys. The assault party will then be supplied by the helicopters which will return with underslung loads. Pioneers and Twin Pioneers will demonstrate supply-dropping and these aircraft will then land for a simulated casualty-evacuation. At the end of this demonstration all the aircraft which have landed will take off, the patrolling Hunters providing an escort. Meanwhile the troops will form up and leave the arena with their vehicles.

In addition to No. 38 Group's demonstration, the R.A.F. will provide three aerobatic displays. The first of these is to be by "The Blue Diamonds" Hunter F.6 aerobatic team of No. 92 Squadron (Sqn. Ldr. B. P. W. Mercer) from R.A.F. Leconfield; Lightning F.1s of No. 74 Squadron (Sqn. Ldr. J. F. C. Howe) from R.A.F. Coltishall will provide the second item; and the third will be by four Flying Training Command Jet Provost T.3s of the Central Flying School, R.A.F. Little Rissington, led by Flt. Lt. F. R. Brambley, which will give a synchronized display with smoke.

Six instructors of No. 1 Parachute Training School, R.A.F. Abingdon, will give a demonstration of free-fall jumping from a Beverley, and six Army parachutists will jump from Austers. As a final R.A.F. item—on days when weather conditions are favourable—some 40 V-bombers and Canberras of Bomber Command will fly over at contrail height.

In addition to these events, the R.A.F. will provide teams to man four Bloodhound SAMs in the missile park.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. S. L. Swain and Gp. Capt. R. D. Williams to the Department of the Air Member for Supply and Organization; Wg. Cdr. D. E. King, D.F.C., to the Department of the Chief of the Air Staff.

Fighter Command: Gp. Capt. T. Balmforth, D.S.O., D.F.C., A.F.C., to R.A.F. Patrington to command; Wg. Cdr. J. Hurrey, D.S.O., D.F.C., to R.A.F. Chivenor to command the Administrative Wing; Wg. Cdr. A. M. Paterson, O.B.E., to R.A.F. Leuchars as Senior Technical Officer; Wg. Cdr. I. Scott to R.A.F. North Coates for operations duties; Sqn. Ldr. P. W. Harle to Headquarters for operations duties with acting rank of Wg. Cdr.

Coastal Command: Wg. Cdr. C. K. Saxelby, O.B.E., D.F.C., A.F.C., to R.A.F. Bally Kelly to command, with acting rank of Gp. Capt.; Wg. Cdr. H. G. A. Scilley to Headquarters for technical plans and co-ordinating duties; Sqn. Ldr. P. C. Beresford to R.A.F. North Front, Gibraltar, to command the Administrative Wing, with acting rank of Wg. Cdr.; Sqn. Ldr. G. Robson to Headquarters for organization duties, with acting rank of Wg. Cdr.

Transport Command: Wg. Cdr. C. R. Johnson, A.F.C., to Headquarters for training duties.

Flying Training Command: Wg. Cdr. J. F. Manning, A.F.C., to R.A.F. Oakington as Chief Instructor; Wg. Cdr. S. Robinson to Headquarters for organization duties; Sqn. Ldr. R. C. S. Bevan to Headquarters for equipment duties with acting rank of Wg. Cdr.

Technical Training Command: Gp. Capt. F. E. Frayn, M.B.E., to Headquarters as Group Captain, Plans; Wg. Cdr. G. H. Ford to the R.A.F. Technical College, Henlow, as Chief Instructor, Weapons Systems, Engineering Wing.

Other Appointments: Gp. Capt. R. D. Elliott, O.B.E., D.F.C., to the Ministry of Defence; Wg. Cdr. J. R. Gard'ner to Brussels as Air Attaché, with acting rank of Gp. Capt.; Wg. Cdr. E. J. Wilson to the R.A.F. Element Allied Air Forces Central Europe, for organization staff duties; Wg. Cdr. G. A. H. Wright to the R.A.A.F.

More Service News

No. 68 Squadron Reunion.—The annual reunion of No. 68 Squadron will be held at the Dorchester Hotel, London, on Saturday, Oct. 21. Reservations can be obtained through Sqn. Ldr. J. M. A. Parker, Officers' Mess, R.A.F. Staff College, Bracknell, Berkshire; the cost, as last year, will be £3.

New Regiment Tie.—The R.A.F. Regiment all-ranks tie, of stripes in five colours, is to be replaced by one of a new design incorporating the official R.A.F. colours. The design is of alternate navy-blue and dark red stripes one inch wide, with crossed rifles and the astral crown in light blue superimposed on the navy-blue stripes. All officers and airmen who are serving or have served in the R.A.F. Regiment are eligible to wear it.

Flying Boat Reunion.—A reunion for all ex-flying boat personnel is to be held on Sept. 23 in the afternoon at the Royal Edinburgh Hotel, Pembroke Dock, and in the evening at the former R.A.F. station. Tickets, price £2 each, can be obtained (until Sept. 16) from Mr. W. R. Foster, Tampines, Phygtle, Rickmansworth Lane, Chalfont St. Peter, Bucks.

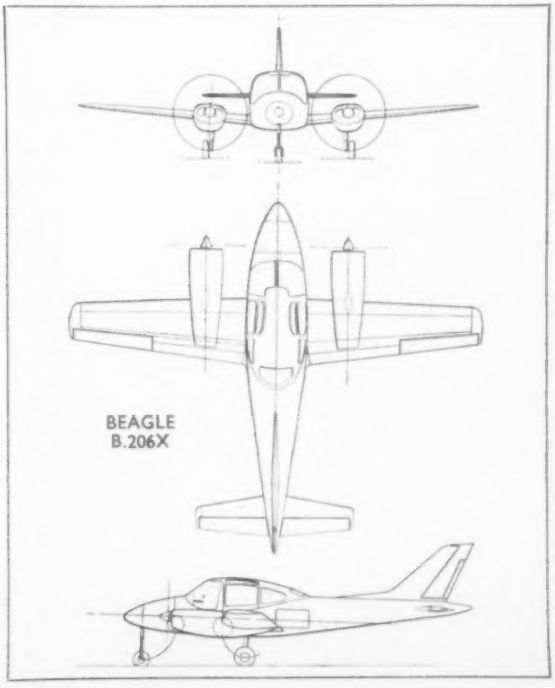
R.A.F.-U.S.A.F.—Colonel C. G. Peterson has been appointed Chief of Staff of the U.S. Fifth Air Force at Fuchu. Born in Idaho in 1920, Col. Peterson flew with the R.A.F. from July, 1941, until he transferred to No. 71 Squadron—the first of the three "Eagle" Squadrons—later becoming its Commanding Officer. In 1943 he assumed command of the 4th Fighter Group, 65th Fighter Wing, of the U.S. Eighth Air Force, and at that time was the youngest full colonel in the U.S. Armed Forces. Since July, 1959, he has commanded the 8th Fighter Wing at Itazuke, Japan, and until recently was Deputy Commander of the 41st Air Division at Johnson Air Station, near Tokyo.

Beagle's Executive Twin

Photographs copyright "The Aeroplane and Astronautics"

LAST week, at 08.07 hrs. on a grey and drizzly morning at Shoreham, the Beagle B.206X prototype, G-ARRM, lifted off the ground on its maiden flight in the hands of John Nicholson, former chief test pilot of the de Havilland Engine Co. For Peter Masefield, energetic managing director of the Beagle Group—who was flying "chase" in his personal Chipmunk accompanied by the Miles Student for the high-speed end of the scale—Tuesday, Aug. 15, was a memorable day. Only 311 days separated the first formal discussions on the design and construction of a twin-engined executive aircraft, following the formation of British Executive and General Aviation, Ltd., and—after a great deal of hard work on all sides—the prototype becoming airborne.

How successfully was soon shown. After an uneventful 40 min. initial flight, during which the undercarriage was retracted and extended, and the general handling assessed, the B.206X (X for prototype) went on to complete three further flights that day, for a total of more than three hours. By late evening G-ARRM had been taken into several corners of its flight envelope at the original C.G. position. It had exceeded 200 m.p.h., and had also been stalled clean, and with 30 degrees of flap extended, showing the remarkably low minimum flight speed in the latter condition of 47 knots, I.A.S. Its first passenger, in the person of George Miles, Beagle-Miles chief designer, had been carried, and John Nicholson's confidence in B.206 handling had been vividly expressed by a fast run at low level over the airfield.



It soon became apparent that Beagle had been both clever and fortunate in achieving excellent handling and control, to the extent that, after further flights on the following two days, in which Peter Masefield acted as flight observer during a 1½-hr. trip, it was possible to send the prototype into the paint-shop to receive its Beagle-bronze and white Farnborough finish with no modifications whatsoever. A Special Cat. C. of A. had been obtained following test flights by A.R.B. pilot Geoff Howitt and, although a lot of work remains to be done in the way of furnishing and equipment, the B.206 is cleared to continue its extensive flying programme prior to its Farnborough début.

It will, in all probability, be the only truly new aeroplane in this year's S.B.A.C. programme and, as such, represents a significant advance for the British aircraft industry. With one or two notable exceptions, the companies in this organization have steadfastly denied the existence of a British or overseas market for the smaller aircraft, for business or private use, and it has been left to a newcomer, albeit manned by some of the best-known names in U.K. light aviation, to prove otherwise.

Peter Masefield became convinced, after an extensive survey, that a large and lucrative market existed for a light twin for both executive and military communications use as long ago as November, 1959, when he was managing director of Bristol Aircraft, Ltd. His proposals went as far as a design outline for the Bristol 220, which was a four-seat, 4,800-lb. light twin, to be powered by two 225-b.h.p. Continental engines, but the company at that stage was too busy with other commitments to spare the manpower to take this project any further.

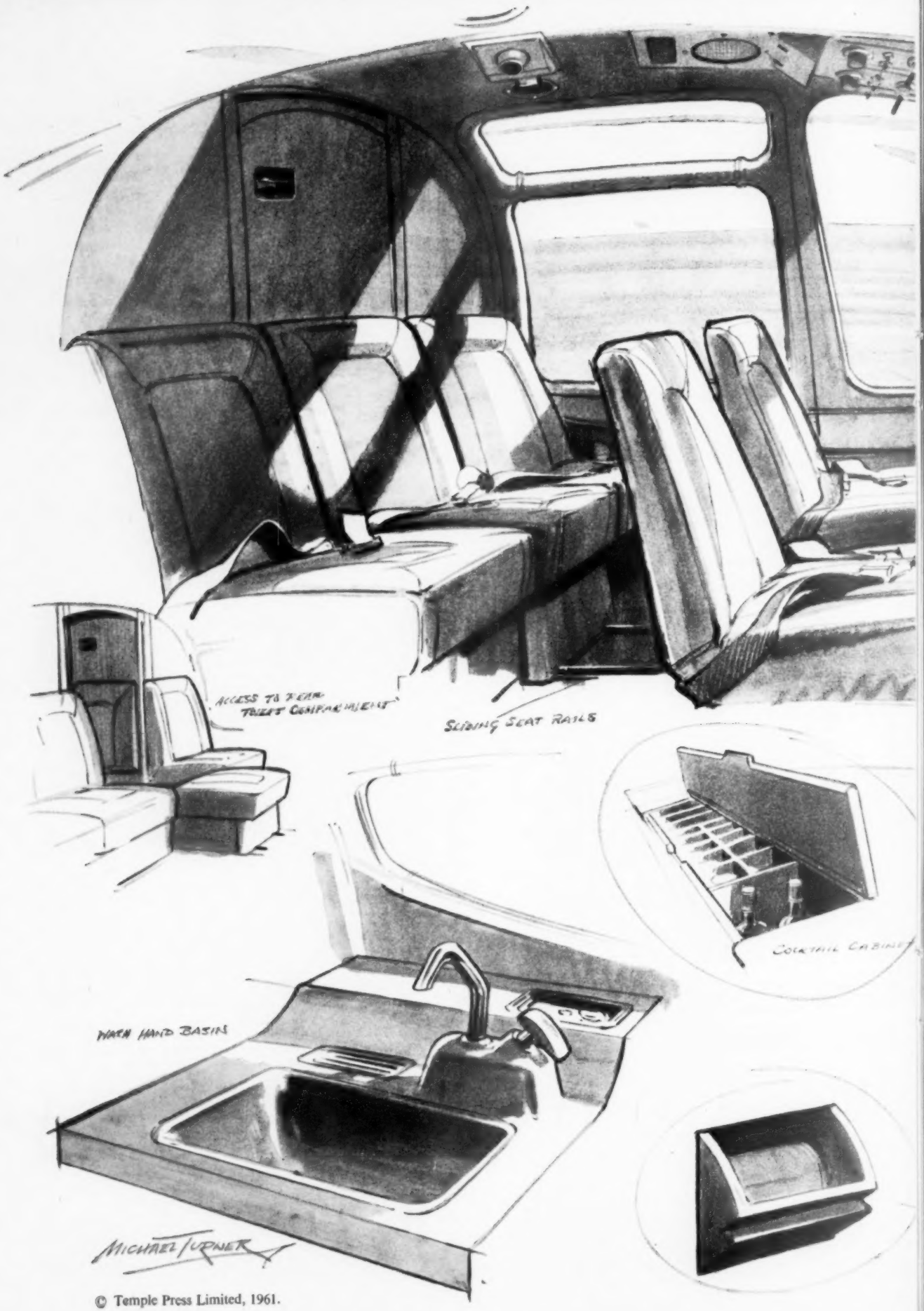
After leaving Bristol Aircraft in April, 1960, Peter Masefield got together with Mike Bellhouse, of Pressed Steel, who is also a pilot-executive, to discuss the possibility of building his twin-project. This had grown somewhat—to five seats and 5,500-lb. all-up weight and rather away from the Bristol formula. It was the first major project to be considered by the new British Executive and General Aviation company on its formation on Oct. 7, 1960, and was eventually given approval by the principals of Pressed Steel, who were behind Beagle.

The Beagle Group has a centralized design team at Shoreham, in which more than 150 people are employed, and also three separate project offices. Of these, that known as Beagle-Masefield is primarily concerned with the B.206, while Beagle-Miles, at the same base, is involved with smaller light aircraft and Beagle-Auster, whose production is at Rearsby, is continuing the development of the high-wing line.

Work on the first B.206 drawings started on Nov. 11, 1960, the finalized design having grown still further, in the manner of these things, into a five-seater with a toilet compartment, or a maximum of seven seats without. Apart from a high cruising speed, one of the main requirements of the design was long range and, to take advantage of this, a toilet compartment is considered essential. In any case, this is becoming general practice in executive aircraft accommodation.

The parameters defined by Peter Masefield for the B.206, after exhaustive market survey, included the ability to fly over 1,000 miles in comfort, day or night in all weathers, with a full payload, and a cruising speed in the region of 200 m.p.h. to give a journey-time of around five hours. It was also required that the aircraft should be simple to operate and maintain in all types of climate, be economic in running costs and be competitive in first price.

Having decided on the basic configuration of low-wing, normal twin-engine arrangement and retractable tricycle under-



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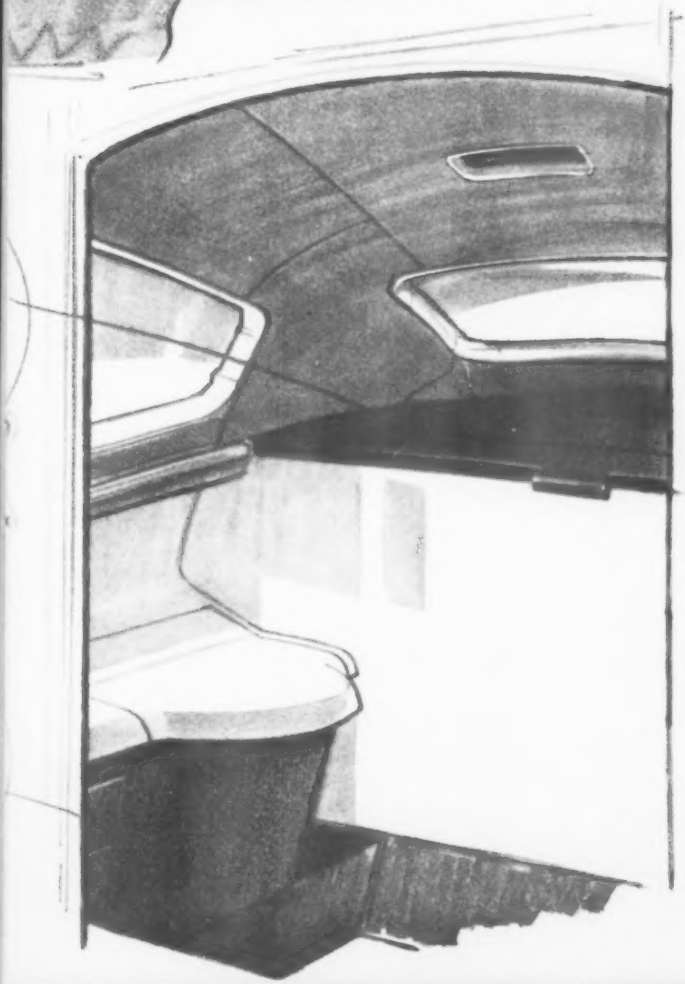
Beagle's Luxurious B.206



carriage, the contours of the B.206 were largely dictated in detail by the necessarily large cabin to accommodate up to seven persons. Space was obtained by making the cabin area broad rather than long, so that the fuselage of the B.206 is of wide cross-section. One of the results of this is that the instrument panel is somewhat wider than that of a Viscount and all occupants have a generous amount of room.

Both front seats have about 4 in. between their outboard points and cabin walls and there is about 11 in. of space between them. An ingenious arrangement in the planning of the five-seat cabin provides for the middle portion of the three-abreast aft seat to slide forward, thereby giving access to a door in the rear bulkhead which opens into the toilet compartment. This has full w.c. facilities, a wash-basin, and accommodation for food and drink, and also gives access to the 200-lb./31.5-cu.-ft. baggage space, which has an additional hatch for ground loading. The rear part of the baggage hatch folds down hydraulically to form "air stairs" for simple access to the cabin, through the single port door.

Entry via this means has been designed to be simple for a "17-stone chairman of 70, or a lady in a tight skirt," according to Peter Masefield. Both tests have been satisfactorily passed, although only in the mock-up, since the prototype is not yet fitted with the air-stairs refinement. Cabin furnishings are to a very high standard, combining the advice of Prof. Misha Black, of the Design Research Unit, with the specialized expertize of Pressed Steel's trim department. Selected hide and fine fabrics and carpeting have been used to give an effect which is both tasteful and efficient.

In all, seven different seating arrangements are offered for the B.206. Apart from the basic five- and seven-seat layouts, these include a six-seat executive version, four- or five-seat couchettes for day or night trips, a five-seat crew or navigational trainer, a three-seat airline trainer and a two-stretcher plus two-seat air ambulance. For "flying doctor" use, the B.206 features stretcher loading through the baggage hatch, and has provision for plasma and other medical installations for in-flight attention.

A Pilot's Aeroplane

Although the B.206 cabin gives absolute priority to executive comfort, the cockpit area takes pilot considerations to an unprecedented level. Apart from the fact that all the senior members of the Beagle Group are themselves active pilots, the optimum arrangement of controls, instruments and seating was further assured at a unique mock-up conference late last year. Forty-two of the leading pilots available in this country, including such names as O. P. Jones, Jeffrey Quill and Neville Duke, were invited to try various types of control column, systems controls and seating arrangements in the mock-up, and to deliver their recommendations at a round-table conference.

The results of their experience can be seen in the B.206 prototype. Both pilots' seats are situated to bring the line of vision forward of the wing leading edge and cabin framing, and the big front screens are cut away at the side for downward visibility. The top of the instrument coaming is kept fairly low to allow optimum forward view over the short nose, and is perfectly straight over most of its width to avoid disorientation when breaking cloud after an instrument approach.

By making the first pilot's seat non-adjustable, it proved possible to stress it for the 25 *g* crash case without undue weight, provision for varying leg and arm length being made by adjustable rudder pedals, complete with toe brakes, and an extending control wheel shaft. After much deliberation, and discussion with the Institute of Aviation Medicine, plain control wheels on push-pull shafts through the instrument panel were chosen for the maximum comfort and safety. The normal layout features quickly detachable dual control, the starboard front seat swivelling aft for use by executive passengers during airborne conferences.

The B.206 meets all BALPA requirements for airline instrument and equipment layout, and has provision for the full range of radio and navigational aids in a centre group, including weather radar. Rheostat-controlled back lighting is provided for the instruments, which include two complete blind-flying panels, with optional direct illumination overhead. In the roof is the standard Beagle feature of a complete starting panel, with master switch, generator field, fuel booster, ignition and starter controls arranged in sequence from front to rear. Production B.206s will also have all engine instruments reading vertically in normal flight, so that abnormal indications will be instantly apparent.

On the front panel is the actuator switch for the variable-incidence tailplane, with an adjacent indicator covering the range of movement between 8° up and 4° down. Only a

Left, having made its first flight earlier in the day, the Beagle B.206X prototype is run up at Shoreham by John Nicholson prior to taking George Miles as its first passenger. The clean nacelle lines and glass-fibre undercarriage doors are noteworthy.

couple of degrees each way has so far been found necessary, despite the powerful double-slotted area-increasing flaps, and it is possible that the anti-servo tabbed elevator and V-I tail will be replaced by a one-piece pendulum unit.

Rear-seat passengers are provided with their own loudspeaker from the radio, together with individual ventilators, reading lights and supply from the combustion heater. The cabin speaker may also be used by the pilot, the interior noise-level of the B.206 being exceptionally low. This has been achieved by the use of a thick front screen and double glazing for all the moulded side panels in the cabin coaming. The coaming itself, which is a built-up double-skinned glass-fibre moulding superimposed on the all-metal semi-monocoque fuselage, incorporates a large forward-hinged door of similar construction.

Another contribution to the low internal noise level is the use of single exhaust augmentor tubes in the outboard side of the nacelles of the 260 b.h.p. Continental IO-470-A flat-six engines in the prototype B.206. The tubes, in conjunction with pressure-sealed, low-drag cowlings, provide forced cooling of the desired amount through exhaust flow, according to operating conditions, and interpose both nacelle and mainplane between the noise source and the cabin.

Airframe Details

In conjunction with the excellent power/consumption characteristics of the Continental fuel-injection engines—which will eventually be built under licence by Rolls-Royce, and drive Dowty-Rotol McCauley constant-speed, feathering metal airscrews—the low structure weight and low drag combine to give long range for a modest fuel load with an unusually high economic cruising speed. Construction of the airframe, which is mostly metal stressed-skin is fairly conventional, although glass-fibre mouldings are used for a number of lightly stressed parts· including the nose cone, undercarriage doors, canopy fairing, wing-tips and tail cone.

Main design aim for the B.206 structure has been to achieve complete structural continuity and built-in resistance to crack propagation. Rigorous control of the working stress levels and the use of lower-strength copper-bearing aluminium alloys for the tension and shear surfaces of the wings and most of the fuselage and tail structure, ensure a long crack-free life. Structural continuity and the lavish use of metal-bonding techniques have led to the virtual elimination of stress-raisers in the highly loaded areas of the airframe.

Representative flight plans are difficult to formulate for this class of aircraft, to establish the true safe life of components, and fail-safe features have therefore been incorporated in critical areas. While no attempt is made to invoke the lower factors on life available for true fail-safe structures, an adequate strength reserve will be maintained following the initiation of minor cracking.

The very clean outboard wing structure which tapers from NACA 23015 to 2412, centres on a continuous flush-riveted torsion box employing metal-bonded stringer skin covers, minimizing the danger of leaks developing in the integral fuel tanks. These tanks occupy most of the torsion box outboard of the nacelles, and provide a normal capacity of 174 Imp. gal. Special care has been taken to avoid their rupture in the event of wing damage.

The main undercarriage units, which have Lockheed legs and American Goodyear (Cessna 310-type) tyres, wheels and disc brakes, are mounted on two robust engine-bearer ribs and retract hydraulically forward into the nacelles, obviating any major cut-outs in the wing torsion box. Leg extension is by gravity and slipstream, thereby eliminating the need for a separate emergency lowering system.

Actuation of the double-slotted flaps, which extend aft and down via simple rotary-type hinges mounted externally beneath the wings, is also hydraulic, with infinitely variable electric selection from the cockpit lever. Flap design is derived from that of the Britannia and, with a 45-degree extension· gives a particularly good low-speed performance.

Nosewheel retraction is also hydraulic—aft into the fuselage. The nosewheel itself is a large-diameter Goodyear unit for grass-field operation and steers through 20° each side of centre from rudder pedal movement. Beyond this angle it disconnects to castor. The Lockheed undercarriage legs have a 9-ft./sec. absorption capacity and are practically up to deck-landing standards. A hooked version of the B.206 is, in fact, envisaged as an "Admiral's barge."

Two longitudinal torsion boxes form the fuselage structure below the baggage-hold floor level and carry the shear and torsion loads from the semi-monocoque rear fuselage across the hold hatchway. Aft of the baggage hold is another compartment for radio packs, with its own access door on the starboard side of the fuselage. In the forward part of the fuselage is the 35,000 B.Th.U./hr. combustion heater, which is thermostatically controlled for cabin air conditioning.

Tail construction is conventional, with twin spars and metal skinning. Like the ailerons, the rudder has an adjustable trim tab and a mass balance, with control wheels operating in the logical planes in the cockpit. All flying controls are of the push-pull type, employing ball races and swinging idle levers to reduce frictional losses. De-icing equipment includes liquid dispersal for the airscrews and a Goodrich lightweight pneumatic system for the mainplanes and tail surfaces.

Being backed by Pressed Steel, the Beagle Group is in an advantageous position to apply certain mass production techniques to its products, and also to use some of the applicable ideas of the automotive industry. This influence is seen in the use of vacuum-formed pressings for some of the sections used internally in the B.206, and also in the procurement of certain items, such as switches and minor instruments, from the accessory lists of quality cars.

The latter makes for very good economics, as will be seen from the use of Aston-Martin windscreen wipers for the B.206 at a fraction of the cost of specially made items, despite the need for careful inspection and a high rejection rate for aircraft application. This sort of low-cost approach is new in British aviation, but is essential if the competitive market price of less than £30,000 is to be achieved.

During the 12 months before the appearance of the first production aircraft many of these automotive lessons will be applied to planning the large-scale construction of the B.206. The aircraft itself will also undergo further development and is to be built with a 5-ft. increase in span, to 43 ft. The 260-b.h.p. Continentals will be replaced by the geared version of the same engine, developing around 320 b.h.p. for take-off, and later versions envisage even further stretch. If the indications of its initial success are any guide, all the portents are that the Beagle B.206 will soon occupy a prominent place in the World executive and communications market.—J.E.F.

Leading Particulars (B.206X)

Dimensions.—Span, 38 ft.; length, 32 ft. 7 in.; height, 12 ft. 3 in.; track, 14 ft.; wing area (gross), 190 sq. ft.

Weights.—Empty, 4,003 lb.; equipped, 4,234 lb.; max. gross, 6,310 lb.

Performance.—Max. level speed, 242 m.p.h.; economical cruise, 228 m.p.h.; initial climb, 1,840 ft./min.; take-off distance to 50 ft., 2,055 ft.; range with max. payload (1,000 lb.), 1,150 miles; max. fuel range, 1,720 miles.

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in their new

B.206 EXECUTIVE AIRCRAFT

Production versions of the B.206 are to be powered by two Rolls-Royce GIO-470-A piston engines. Facilities are now being established by Rolls-Royce for the production of these and other light aircraft engines under licence from the Continental Motors Corporation of America. Selected engines from this series, of Rolls-Royce manufacture, are scheduled for delivery in 1962.

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Beagles Turned Loose

WITH seven new types of aircraft in its pre-Farnborough release, the Beagle Group has a busy development programme ahead of it over the next year or two. In addition to the major current project, the five/seven-seat B.206 executive twin, which is described in detail elsewhere in this issue, the range of new types covered by Beagle includes both single- and twin-engined low-wing four-seaters from the Miles division; high-wing military and civil Austers; and a completely novel departure into the rotary-wing field with the development of the Beagle-Wallis single-seat lightweight autogyro.

Details of some of the types, including all three Beagle-Austers—the Airedale, the re-engined A.O.P. Mk. 11, and the Terrier—have been previously available, but the Miles division products, the single-engined M.117 and the M.218 light twin, are completely new. They are 1962 aeroplanes, and the Beagle-Wallis autogyro is also the subject of longer-term development. In fact, nothing is yet being released on this one-man rotorcraft, which will, however, be featured by photographs and details on the Beagle Group stand at Farnborough.

At this stage a recapitulation of the Beagle Group organization might well be useful: In addition to the main company of British Executive and General Aviation, Ltd., which is a subsidiary of the Pressed Steel Co., Ltd., and has its headquarters at Shoreham, aircraft are designed and constructed within three main branches. These comprise the Masefield-Beagle twin-engine executive range; the Beagle-Auster high-wing single-engine range; and the Beagle-Miles low-wing light twin- and single-engine range. Only the Auster and Miles divisions are distinct companies, although there is one other component with a separate identity—Beagle Aviation Finance, Ltd.

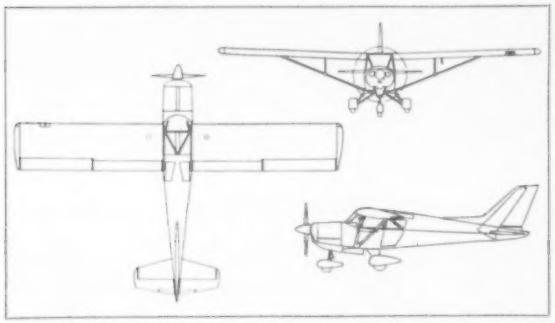
Beagle-Miles are based at Shoreham, alongside the headquarters of the Group; Beagle-Auster are at Rearsby; and there is a third airfield within the organization at Kidlington, which is the main base for repairs, overhaul and maintenance of the Beagle Air Service Division. Managing director of British Executive and General Aviation, Ltd., Mr. Peter Masefield is also chairman of Beagle-Auster and Beagle-Miles.

Brief details of each aircraft in the new Beagle range are given below.

* * *

BEAGLE-AUSTER A.109 AIREDALE.—First of the Beagle pack to leave the Rearsby kennels, the Airedale represents a radical modernization of the well-tried Auster formula, and more than 100,000 man-hours have so far been expended on it. With four seats, front and rear doors, a lockable and separate baggage compartment, the Airedale is designed to incorporate the best of car practice in its interior furnishings and appointments, which are of a very high standard.

Four prototypes are currently flying, initially with the 180 b.h.p. Lycoming O-360 flat-four engine, but one of these is being re-engined prior to Farnborough with the 175 b.h.p. Continental GO-300



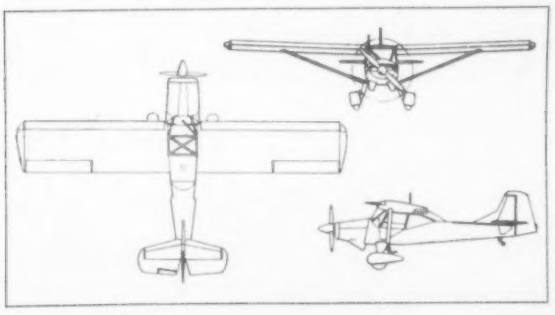
flat-six geared powerplant of the type subsequently to be built by Rolls-Royce. Both variants have a Dowty-Rotol McCauley variable-pitch airscrew, which is installed within the standard price of £4,750.

Dimensions.—Span, 36 ft. 4 in.; length, 26 ft. 4 in.; height, 10 ft.; track, 6 ft.; wing area, 190 sq. ft.; section, NACA 23012.

Weights.—Normal payload, four persons; full normal fuel (32 gal.); 135 lb. baggage; max. gross, 2,750 lb.

Performance.—Max. level speed, 148 m.p.h.; max. continuous cruise, 141 m.p.h.; economical cruise, 135 m.p.h.; initial climb, 730 ft./min.; take-off to 50 ft., 1,200 ft.; normal range, 650 miles; max. range (52 gal.), 1,050 miles.

BEAGLE-AUSTER A.O.P. MK. 11.—A private venture development, in collaboration with the Army Air Corps, of the standard Auster A.O.P. Mk. 9, the new Mk. 11 has been re-engined with the 260 b.h.p. Rolls-Royce/Continental IO-470 flat-six engine, for STOL capability. The improved performance is particularly directed towards tropical and high-altitude conditions, under which at a gross weight of 2,119 lb. at 7,000 ft. airfield elevation and I.S.A.+30°, the take-off run to 50 ft. in zero-wind is 1,155 ft., and the initial climb is 1,040 ft./min. Cruising speed has also been increased by more than 35 m.p.h. Another point is that the anticipated hours between overhaul of the Rolls-Royce/Continental engine is 50 per cent. greater than the corresponding period for the A.O.P.9. There is



naturally a good deal of Army interest in the Mk. 11, which made its first flight on Friday, Aug. 18.

Dimensions.—Span, 36 ft. 4 in.; length, 23 ft. 8 in.; height, 8 ft. 11 in.; track, 6 ft. 8 in.; wing area, 198 sq. ft.; wing section, NACA 23012.

Weight.—Max. gross, 2,550 lb.

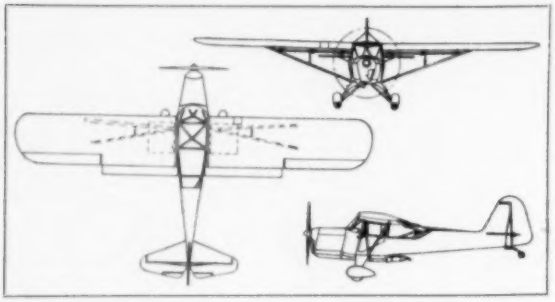
Performance.—Max. speed, 152 m.p.h.; max. cruise, 148 m.p.h.; initial climb, 1,330 ft./min.; take-off distance to 50 ft., 804 ft.; landing distance from 50 ft., 609 ft.; max. endurance (30 gal.), 4.8 hr.

(*Continued on page 210*)

Beagles Turned Loose . . . .

BEAGLE-AUSTER A.61 TERRIER.—A civilianized development of the ex-Army Auster A.O.P.6, the Terrier is a robust, reliable and very cheap three-seater which has been soundproofed, draught-proofed and furnished to a very comfortable standard. Instrumentation and controls have also been rearranged for maximum ease and efficiency, while flying qualities have been improved by redesign of the ailerons.

A particularly attractive feature of the Terrier is the low noise



level, achieved by the extra-long exhaust pipe and silencer. It is also an excellent glider-tug, being able to tow the average 600-700-lb. two-seat sailplane with two up to 2,000 ft. in about 6¼ min., or about half the time taken by earlier tugs in service. The Terrier is powered by a 145 b.h.p. Gipsy Major 10 engine.

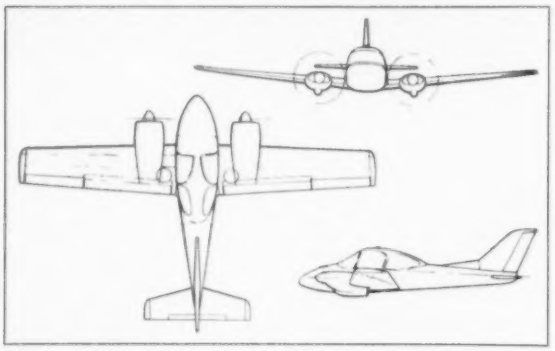
Dimensions.—Span, 36 ft.; length, 23 ft. 3 in.; height, 8 ft. 11 in.; track, 6 ft.; wing area, 184 sq. ft.; wing section, NACA 23012.

Weight.—Max. gross, 2,350 lb.

Performance.—Max. speed, 123 m.p.h.; normal cruise, 110 m.p.h.; max. range, 415 miles.

BEAGLE-MILES M.218.—George Miles, technical director of the Beagle Group and chief engineer of Beagle-Miles Aircraft, has created a very attractive four-seat design in the M.218, which can be looked on as a successor to the popular Gemini light twin. Resembling in many aspects a scaled-down B.206, the M.218 is powered by two 100-b.h.p. Continental O-200A flat-four engines, driving Dowty-Rotol McCauley variable-pitch feathering metal airscrews.

The M.218 prototype, which is being built at Shoreham, and is due to fly in mid-1962, will be furnished and equipped to the Beagle standard, with adjustable seats and large-access doors on each side of the fuselage. Construction is all-metal; the trailing edge of the mainplane is only 24 in. from the ground for easy



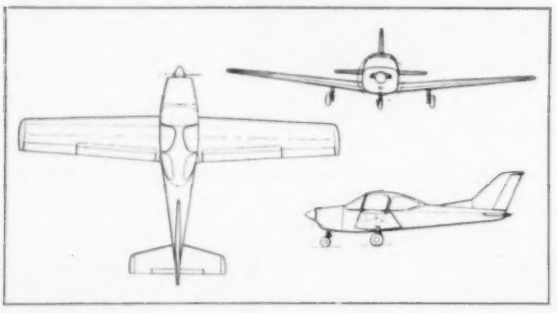
cabin access. Full dual control will be installed, with spectacle-type grips. Tail trim is by variable-incidence tailplane, and the flaps are of the single-slotted type. The steerable nosewheel undercarriage is retractable. The forecast cost is in the region of £5,000.

Dimensions.—Span, 37 ft.; length, 25 ft. 3 in.; height, 7 ft. 5 in.; wing area, 170 sq. ft.; track, 12 ft. 6 in.

Weights.—Max. gross, 2,750 lb.

Performance.—Normal continuous cruise speed, 150 m.p.h.; full load range, 645 miles; ferry range, 1,000 miles.

BEAGLE-MILES M.117.—This attractive little two/three-seat all-metal low-wing monoplane is essentially a single-engine version of the M.218 twin, powered by a 100-b.h.p. Rolls-Royce/Continental O-200A engine. It also features a slab-type tailplane for longitudinal control, but its steerable nosewheel undercarriage is fixed. Full dual control is available with either spectacle-wheel or stick arrangements, and the wings are fitted with single-slotted flaps. The 12 ft. 6 in. undercarriage track is unusually wide for an aircraft of its size, to give exceptional ground stability.



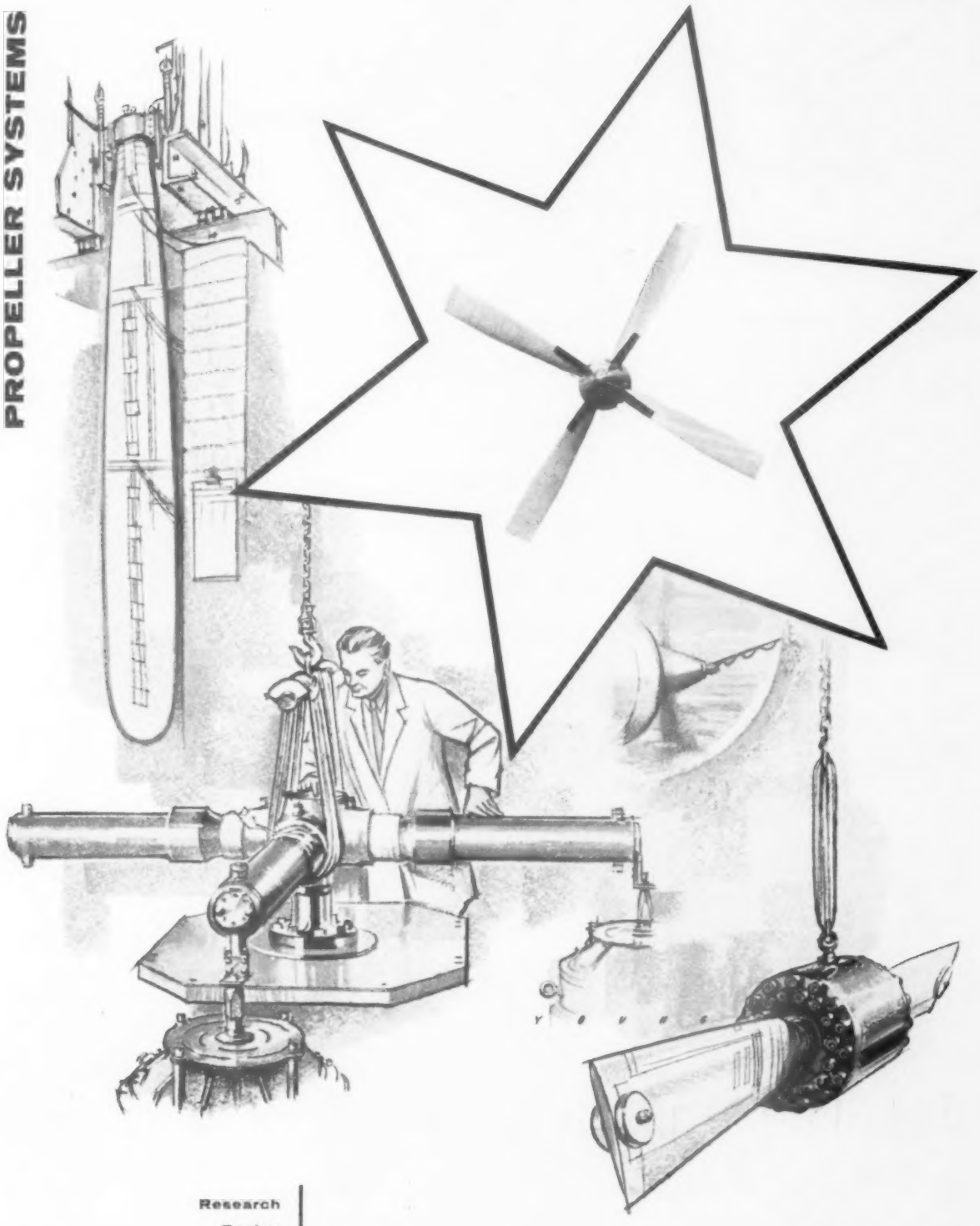
Fuel consumption should be less than 4 gal./hr., compared with 7.7 for the M.218, giving something like 22 a.m.p.g. The M.117 is designed for touring and training and, at a projected price of £2,000, should find favour with both club and private pilots. First flight date will be mid-1962.

Dimensions.—Span, 37 ft.; length, 26 ft. 1 in.; height, 7 ft. 5 in.; wing area, 170 sq. ft.; track, 12 ft. 6 in.

Weights.—Max. gross, 1,550 lb.

Performance.—Max. speed, 123 m.p.h.; normal cruise, 115 m.p.h.; initial climb, 826 ft./min.; take-off to 50 ft., 975 ft.; range with capacity payload, 270 miles; max. fuel range, 670 miles.

PROPELLER SYSTEMS



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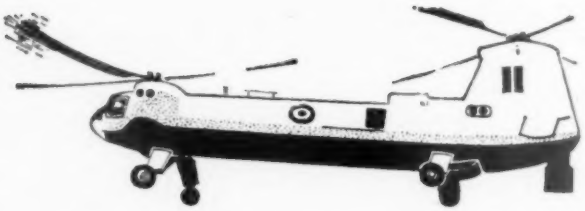

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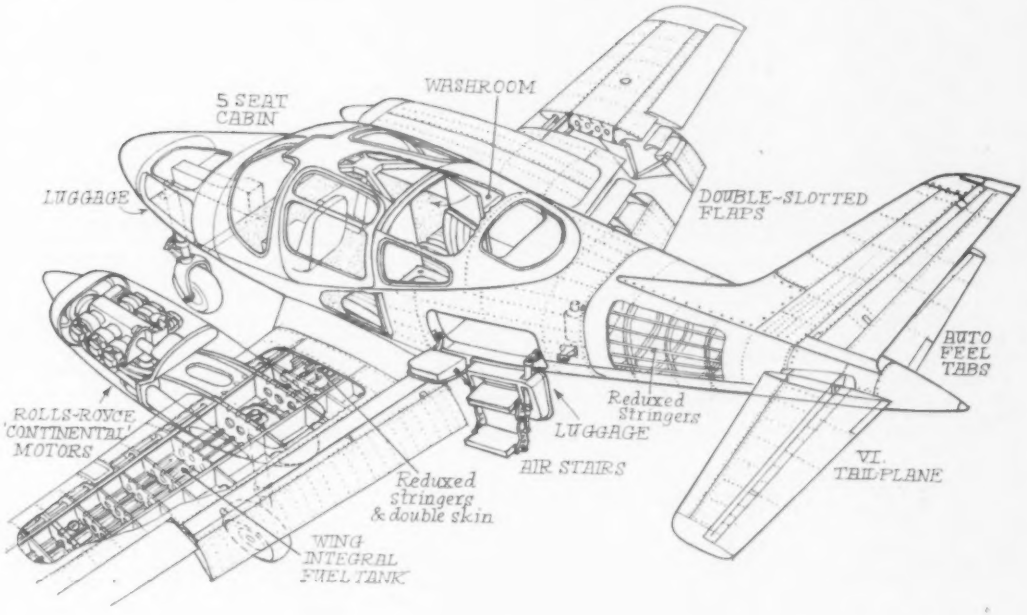
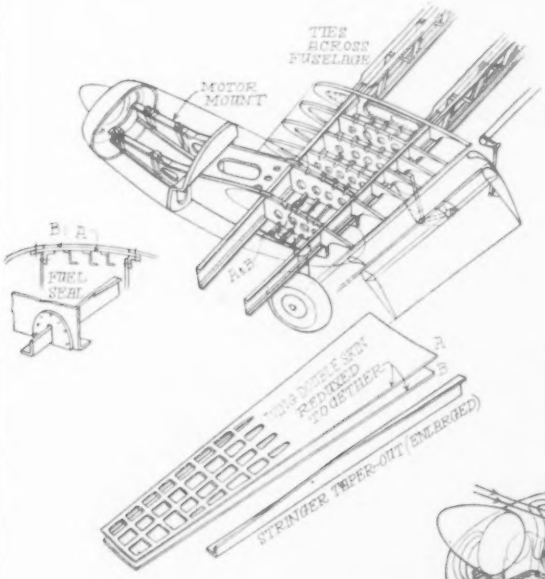
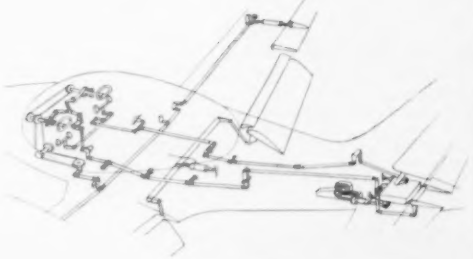
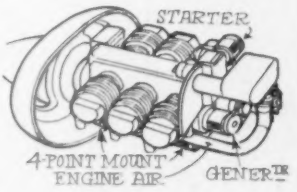
Beagle Details

These drawings by J. H. Clark, A.R.Ae.S., of the new Beagle B.206 can be related to the article on this aircraft beginning on page 205.

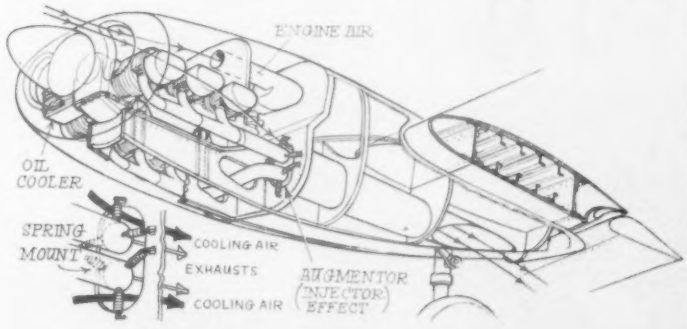








In this group of sketches can be seen details of wing structure, including doubled wing-skins, engine mounts, control system and engine layout.



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Mounting details of the B.206X Continental powerplants of 260 b.h.p. are apparent in the right-hand drawing. Production aircraft will have the 320 b.h.p. GIO-470-A version of the same engine, manufactured by Rolls-Royce.

Probing the Radiation Frontier

NOW that men are beginning to make spaceflights of longer duration, one of the problems needing urgent and concentrated study concerns the various energetic particles which populate the regions beyond the Earth's protective atmosphere. One of several new space-vehicles designed to investigate these particles is the S-3 satellite which was launched on Aug. 15 into an orbit with a perigee of about 170 miles and an apogee of some 50,000 miles. It is now known as Explorer XII.

The S-3 is the first of four such satellites which NASA have devised to make repeated observations of the "solar wind," the interplanetary magnetic fields, the distant regions of the Earth's magnetic field, the "particle population" of interplanetary space and the Van Allen radiation belts. The latter, which are traversed twice during the estimated 31-hr. orbital period of the satellite, surround the Earth at latitudes of less than 70° and at distances between 600 and 30,000 miles.

Mainly responsible for the Energetic Particles Satellite—as the S-3 is called—is the Goddard Space Flight Center, which is also concerned with the satellite's integration with the Delta launching vehicle and tracking and data reduction. Weighing 83 lb., the octagon-shaped satellite has been variously instrumented by U.S. universities and Government laboratories.

Essentially, the project has six research tasks. The Goddard Space Flight Center has instrumented the vehicle for the detection of cosmic rays, has fitted an ion electron detector, and is performing a solar cell experiment. A proton analyser experiment has been provided by NASA's Ames Research Center, a magnetic field experiment by the University of New Hampshire, and investigation of trapped particle radiation is being made by the State University of Iowa.

In addition there is a Goddard photocell optical sensing system which will furnish information on the satellite's orientation in space.

The experiments will measure the entire particle spectra from energies of a few electron volts to a thousand thousand million volts. A magnetometer on a boom, some 32 in. from the satellite body, will determine the particles' interactions with magnetic fields.

At its greatest distance, the satellite will be essentially in interplanetary space beyond the influence of the Earth's magnetic field. In this region electron and proton particles are normally few (less than 100 to the cubic inch) and very slow-moving. The number of cosmic rays is even smaller (less than one to the cubic yard), but the interplanetary magnetic field still slightly influences a particle's motion with a force about 1/10,000th the strength of the Earth's magnetic field.

As the satellite moves away from the maximum distance, it will pass through the Van Allen belts girdling the Earth—the regions where energetic particles are trapped by the Earth's magnetic field.

The satellite was launched at an angle of 33° to the equator, However, due to the high eccentricity of the orbit and the small power of its transmitter, it will be one to two weeks before an accurate estimate of its orbit can be determined. An orbital period of approximately 31 hours will make the spacecraft visible for about 23 hours a day at tracking stations on the apogee side of the Earth. Three Mintrack stations—at Woomera, Australia; Santiago, Chile; and Johannesburg, South Africa—will record the telemetry signals 90% of the time. Telemetry will be recorded continuously for one month and periodically thereafter. On the first orbital pass, perigee should be 14°N. latitude 49°W. longitude (Atlantic Ocean). At apogee, the position should be 12°S. latitude 99°W. longitude (Pacific Ocean).

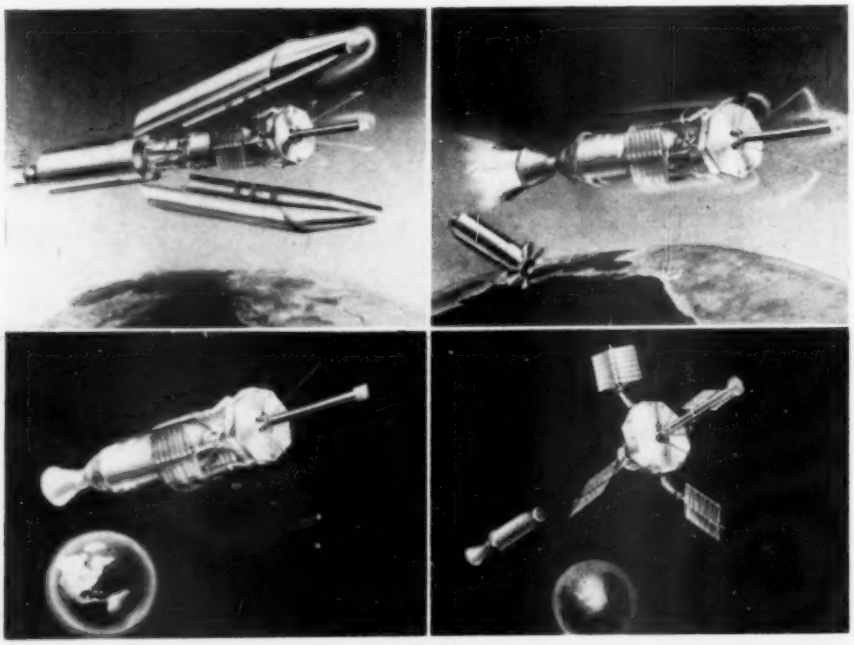
Instrument Packaging

The S-3 satellite represents something of a milestone in space engineering design for its ability to accommodate 10 particle detecting systems, and associated electronics, in so compact a manner; the usable volume is only 1.578 cu. ft. The centre-body takes the form of an octagon-shaped platform, manufactured from nylon honeycomb and glass fibre, with an aluminium cover; it houses most of the instruments and electronic equipment. The octagonal container measures 26-5/32 in. across the flats and is 5½ in. thick. A transmitter is fitted in the base of the payload, allowing heat to dissipate through the structure and the aluminium cover.

A magnetometer package—containing three orthogonally mounted saturable core magnetometers and calibration coils—is located forward of the platform on a 32-in. boom. This reduces field effects due to instruments and electronics.

Four spring-loaded solar-cell panels of 3.84 sq. ft. area extend from the centre-body, folding around the last stage of the launching rocket and being covered with a fairing. Pictures on this page show the separation of the fairing, the satellite's release from the final stage, and the extension of the solar cell panels. "Yo-yo" weights are used to reduce the rate of spin of the last stage to 31 r.p.m. after burn-out, almost 2,000 miles from Cape Canaveral at a velocity of more than 24,000 m.p.h. The solar cell panels are spread before the S-3 has separated from the last stage after a 24-min. coast period when an explosive-actuated cutter severs a nylon lanyard. Erection of the paddles further reduces the spin to approximately 18 r.p.m.

The Optical Aspect Sensor is designed to determine the orientation of the satellite as a function of time. Six photo-diodes



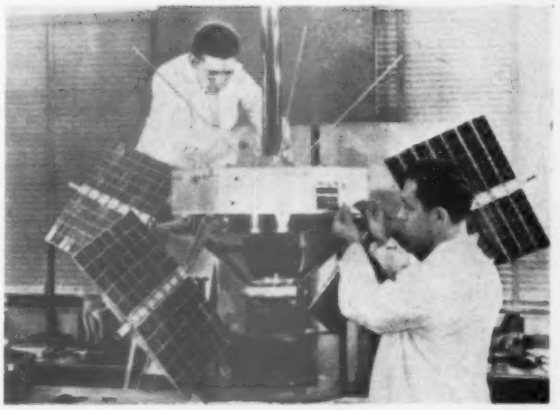
Injecting the S-3 satellite into orbit. The second stage, top left, ignites at an altitude of more than 40 miles and some 90 miles downrange from Cape Canaveral. Explosive bolts are detonated after another 40 seconds to release the nose fairing. When the vehicle is 1,300 miles downrange and at an altitude of about 160 miles (top right), explosive bolts separate the second and third stages. The third stage fires and is spin-stabilized. "Yo-yo" weights reduce the spin of the third stage and the satellite (bottom, left); burn-out occurs almost 2,000 miles from Cape Canaveral at a velocity of more than 24,000 m.p.h. Finally (bottom, right) the four solar cell panels are extended and Delta's final stage separates from the S-3 satellite.

give 180° digital indication of the Sun's elevation with respect to the vehicle's spin axis—the 180° from pole-to-pole being divided into 63 parts. The time within the telemetry frame of the Sun's appearance is coded in binary form.

Read-out of all the time and position information is by two telemetry channels. The system consists of two basic parts. The first is a digital solar aspect sensor, consisting of a light mask and a number of photo-diodes placed behind the light mask so that each photo-diode sees only the portion of the light mask directly behind it. The second part is a digital computer having memory and logic for determining the time at which a photo-diode sees the Sun and for remembering which photo-diode had the input. The sensor package is basically rectangular 2 in. x 2.5 in. x 2 in. and weighs 248 grammes. The electronics is a printed card, 5 in. x 7 in.

Additional data: S-3 total weight, 83 lb.—including electronics, 24.5 lb.; scientific instruments, 17.85 lb.; structure, 11 lb.; solar cells (5,600), 11 lb.; each solar cell panel measures 13.63 in. long x 20.18 in. wide. Weight of 13 silver-cadmium storage batteries, providing 15W. of power, 11 lb.; 5W. available from solar cells. A 2W. 136 Mc/s. transmitter provides 50 samples of telemetry per second.

Delta launching vehicle: lift-off weight, nearly 112,000 lb.; first stage thrust, 150,000 lb. x 160 sec.; second stage thrust, 7,500 lb. x 109 sec.; third stage thrust, 3,000 lb. x 42 sec.



Technicians complete the assembly of the S-3 satellite. When attached to the final stage of the Delta launching rocket, the solar cell panels fold into a square around the solid-propellent motor.

Explaining "Project Needles"

IN recent months there has been growing criticism, mainly from the optical and radio astronomers, of the United States project to launch into orbit millions of fine dipoles as part of an experiment in long-distance radio communications. The intention is to scatter the "needles" from a space-vehicle equipped with a rotating dispenser, and latest reports indicate that the project is to go ahead.

Apart from genuine doubts concerning the influence of this and possible future experiments of similar kind on other research activities, certain misconceptions concerning the scope of the project appear to have arisen. For these reasons, we are pleased to publish in full the statement which the Space Science Board of the National Academy of Sciences released in Washington on Aug. 11. The experiment is now being carried out under the name of Project West Ford The statement reads:—

Because of widespread scientific interest, both domestic and international, in Project West Ford, the Space Science Board of the National Academy of Sciences is making available to the scientific public some relevant detail concerning its studies of the experiment, together with the Government's policy relating to the project.

Project West Ford is a communications experiment designed to place 35 kg. of hair-like tuned (8,000 Mc/s) copper dipoles in a short-lived belt around the Earth. Such a narrow belt far away from the Earth—a few thousand kilometres—would reflect radio-waves at 8,000 Mc/s. The project is a single experiment being performed for the United States Government by the Lincoln Laboratory of the Massachusetts Institute of Technology. Its purposes are twofold: (i) to investigate the technical feasibility of utilizing orbiting dipoles as passive reflectors for relaying communications and (ii) to provide an opportunity for an objective assessment of the possible effects of the dipole technique on space activities or on any branch of science.

The Space Science Board was informed of the proposed project in the fall of 1959 by the Director, Lincoln Laboratory (Massachusetts Institute of Technology) and, at his request, undertook to examine the effects of the experiment on any field of basic scientific research. Since December, 1959, the Board, through appointed study groups of scientists, has continued to work closely with Lincoln Laboratory project personnel in a scientific advisory and impartial evaluation capacity with particular concern for any harmful effects on observational astronomy, radio or optical. The board in June, 1960, acting on the findings of the study group, concluded (in essence) that: (i) the West Ford experiment would not have an adverse effect on any branch of science; (ii) planning for future systems must protect the interests of astronomical research; (iii) full scientific and operational information about West Ford should be published as soon as possible; (iv) radio astronomical research needs the protection of appropriate World-wide agreement.

These findings and recommendations were made available to the Lincoln Laboratory and the Government. The Board stimulated public presentation and publication of relevant scientific informations (Refs. 1 and 2). Invitations to participate in making observations of the West Ford belt have also gone to astronomers and observatories in many countries, on behalf of the Space Science Board, thus attempting to derive the maximum amount of experimental data from Project West Ford.

The Board has recently received from Dr. Jerome B. Weisner, Special Assistant to the President for Science and Technology, the U.S. Government policy on the West Ford project, which it can now make available to the scientific community.

"The United States Government, in conducting the West Ford Project, will be guided as follows:

"1. No further launches of orbiting dipoles will be planned until after the results of the West Ford experiment have been analysed and evaluated. The findings and conclusions of foreign and domestic scientists (including the liaison committee of astronomers established by the Space Science Board of the National Academy of Sciences) should be carefully considered in such analysis and evaluation.

"2. Any decision to place additional quantities of dipoles in orbit, subsequent to the West Ford experiment, will be contingent upon the results of the analysis and evaluation and the development of necessary safeguards against harmful interference with space activities or with any branch of science.

"3. Optical and radio-astronomers throughout the World should be invited to co-operate in the West Ford experiment to ascertain the effects of the experimental belt in both the optical and radio parts of the spectrum. To assist in such co-operation, they should be given appropriate information on a timely basis. Scientific data derived from the experiment should be made available to the public as promptly as feasible after the launching."

In the light of its studies and of the above policy of the U.S. Government, the Space Science Board concludes:

1. The Project West Ford experiment will constitute no interference to optical or radio astronomy. As a matter of fact, the belt will be barely detectable, even by astronomers with advance information and upon the taking of special efforts for detection. It is true that a belt or belts could be erected which could cause serious interference to astronomical observations; however, the United States Government policy provides that no further launches of orbiting dipoles will be planned until the West Ford results have been analysed and evaluated and, further, will be contingent on the development of necessary safeguards.

2. The Board will continue its studies of this area of experimentation on behalf of the scientific community. In these studies it will depend on objective and quantitative assessments that constitute the foundation for scientific discussions, recommendations and decisions. These assessments can only be achieved through a carefully controlled, harmless test, and Project West Ford provides a clear opportunity for scientists of all nations to co-operate in making observations to form the basis for an objective understanding of the behaviour of an orbiting dipole belt, both in terms of its astronomical properties and of its communication capabilities.

3. The Board will continue to keep the scientific community everywhere informed and it invites the co-operation and assistance of scientists everywhere who have interest and specialized knowledge in this area. The Board acknowledges with gratitude the assistance of many scientists—both at home and abroad—who have already contributed to its studies.

References

[1] General Assembly of the International Scientific Radio Union (URSI, London, September, 1960).

[2] *Astronomical Journal*, Vol. 66, 3, pp. 105-118.

Enter the "Plastinauts"

THREE dummy astronauts are being prepared for launching by the U.S.A.F. later this year in a series of experiments designed to explore the likely effects on the human organism of exposure to radiation in space. They will be made of rubber-based plastic on a skeletal framework.

Each dummy, weighing 10 stone 12 lb., will be 5 ft. 9 in. tall. The plastic covering is designed to absorb radiation in the same way as human tissue, and small ionization chambers, placed in certain parts of the interior, will be used to detect the more energetic particles; it is proposed to telemeter the results to ground stations.

The "plastinauts," as they are known in the U.S.A.F., have been designed to travel "in any space vehicle designed to carry a man."

A Glimpse at Vostok I

KENNETH W. GATLAND *reviews the Soviet documentary film, now on provincial release. It will be seen in London from Sept.* 3.

THE World has yet to see a definitive account of Major Yuri Gagarin's orbital mission in Vostok I. That is the disappointing conclusion to be drawn from the Russian colour documentary film, "With Gagarin to the Stars," which was shown to the Press on Aug. 15.

The first and most obvious point is that the film does not show the actual launching. As we had previously suspected from the "stills," published in our issue of Aug. 10, this aspect of the proceedings has been simulated by fragmentary shots of the take-off of a T-1 tactical missile—which is about as far removed from a multi-stage space-booster as the Chrysler Redstone is from the mighty Saturn. The first time this missile type passed before Western eyes was during the Red Square parade in November, 1957, commemorating the 40th anniversary of the Bolshevik Revolution.

When the rocket is first seen in the film, it is rising through a billow of exhaust smoke and before the tail-end emerges the film cuts to a long-shot of the missile well up on its trajectory with a glimpse of exhaust flame and tail finning.

What is perhaps more incredible is that Soviet film-makers should depict the launching of Strelka and Belka in Spacecraft II—a similar 10,008-lb. vehicle to Vostok I—with a geophysical rocket of the type used to carry scientific instruments and dogs on "up-and-down" trajectories. Jettisonable instrument pods are attached to the sides of the body and, despite the distance from which the film is taken, it is possible to discern the detachable nose-cone which is recoverable by petal drag-brakes and a parachute.

Both rockets are single-staged and, of course, quite incapable of launching satellites.

The situation is little better when Gagarin is seen arriving at the launching site. He emerges from a coach clad in his orange-coloured pressure-suit, is seen from above walking to the lift below the gantry, and the lift is shown ascending. Yet miraculously the camera manages to hide all parts of the rocket booster—except for a trace of (oxygen?) vapour which wafts across the screen.

The most revealing part of the film is a close-up of the large hatch in the Vostok spacecraft through which the astronaut's ejector couch is introduced into the pressure cabin. Although, again, there is no overall view of the spacecraft on the launcher, the film does appear to confirm that the large aperture visible in the Tushino exhibit (THE AEROPLANE AND ASTRONAUTICS, Jly. 13, 1961, p. 31) is, in fact, one of the ejector ports for the astronaut's couch. The couch is installed across the body of the spacecraft so that *g*-loading is taken chest-to-back.

How the astronaut is positioned during re-entry is still obscure and, as we stated in our initial review on Aug. 10, there are no scenes at all illustrating the landing or the vehicle on the ground. Clearly, the Russians are particularly sensitive over this aspect of the mission, which may indicate that the spacecraft has something more than a simple parachute recovery system. Could it be, for example, that adjustable drag-brakes are used for controlling the re-entry trajectory?

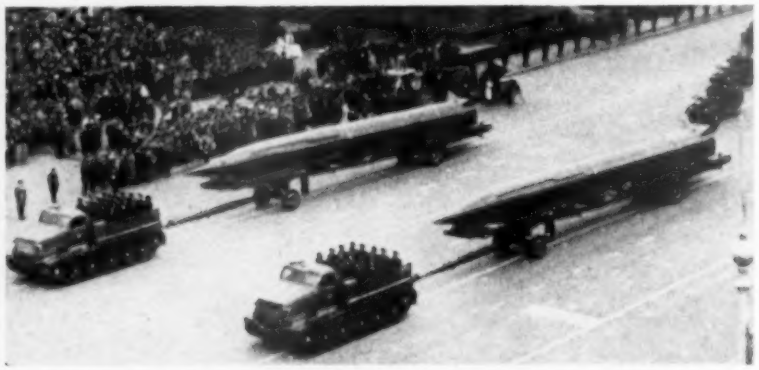
The only overall view of the Vostok is when the vehicle is seen in a brief shot depicting the pressure-capsule being fitted to what appears to be the instrument container and retro-rocket section. The latter bears some resemblance to the final stage of the Lunik launching vehicle, a replica of which was recently seen at the Soviet Trade and Industry Exhibition at Earls Court (THE AEROPLANE AND ASTRONAUTICS, Jly. 20, 1961, p. 84). On top of the pressure-capsule, a white-coated technician is seen adjusting twin pistons which presumably help to separate the instrument section prior to the capsule's re-entry into the Earth's atmosphere. There is no hint of the tail-annulus seen on the Tushino exhibit—which seems almost certain to have been added for ease of handling beneath the supporting helicopter.

The most interesting part of the film comes near the end when the colour camera moves inside the Vostok's cabin to show the astronaut's couch and various items of the equipment. Not only is the cabin spacious but, in a revealing close-up, the equipment appears to be of exceptionally high standard. This applies particularly to the "optic orientator" fitted to one of the viewing ports. It is this instrument which gives the astronaut a visual indication of the horizon for the spacecraft's manual orientation. Comprising two annular mirror-reflectors, a light filter and a latticed glass, the instrument is seen being operated; technically this is one of the best moments in the film. Another interesting close-up shows the globe which revolves synchronically with the vehicle's motion over the Earth, providing a constant indication of the astronaut's geographical position.

Earlier, the prospective "space candidates" are seen in training. "Yuri Gagarin graduated from the Flying School at Orenburg with honours in 1957," the commentary relates; "this was the year of Sputnik I." The film goes on to suggest that it was only after the launching of Lunik III—in October, 1959—that "Gagarin was asking to be trained as a space-pilot." There were "thousands of applicants coming in—and a lot of selection was needed." This part of the film—allegedly from the official record—is shot in sepia and shows the trainees undergoing various physical exercises, including cross-country running, jumping, playing volley-ball, diving and parachute jumping. There are sequences showing men undergoing conditioning experiments in a decompression chamber, in an isolation chamber and in a centrifuge. Short periods of weightlessness are simulated in a Tu-104 flown on a controlled parabolic trajectory. Laboratory endurance tests also include swinging back and forth for hours on end in a rig, and tests on a mechanical vibrator.

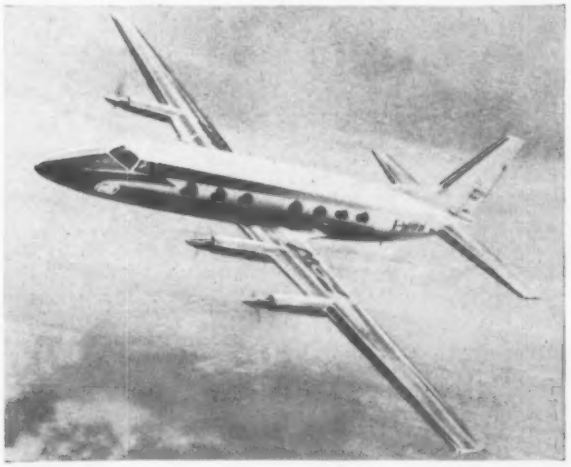
Gagarin is also seen facing the State Commissioners—the Soviet "top brass" responsible for seeing the project through from design to launching; the Red Air Force appears to be heavily represented.

From all this it can be appreciated that "With Gagarin to the Stars" is not without interest; some may consider it "out of this World," but one thing is quite certain: it is definitely *not* interstellar.



At left we publish again the picture from the film which purports to show the launching of Vostok I. There seems little doubt that the rocket represented is the single-stage T-1 tactical missile seen, at right, in Red Square during this year's May Day parade. Note, for example, the position of the "zig-zag" external conduit.

BLACKBURN TURBOMECA ASTAZOU



A fully developed and type-tested turbo-prop engine, in the 500–600 h.p. bracket, now in production for the forthcoming generation of executive and communications aircraft.

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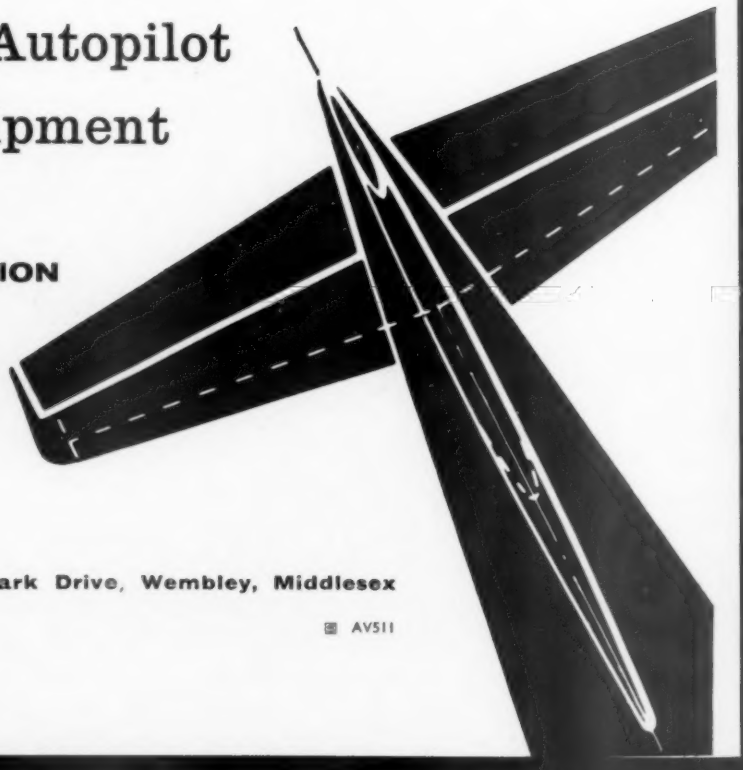
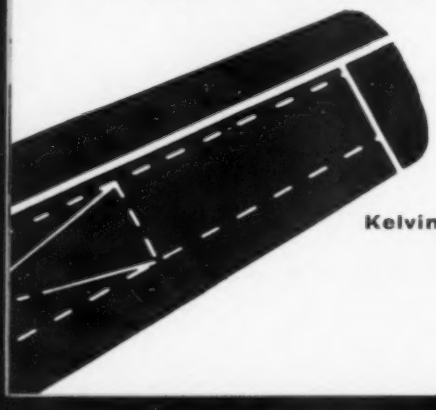


SMITHS AVIATION DIVISION

The Aviation Division of S. Smith & Sons (England) Ltd.



Kelvin House, Wembley Park Drive, Wembley, Middlesex

AV511

JET-DAK.—Fairey Aviation Co. of Australasia is modifying three T.A.A. DC-3 freighters to have JATO. They are for use on the Sunbird services in Papua and New Guinea.

(*Continued from page 199*)

LEBANON CARAVELLE.—A Caravelle for Air Liban (registered OD-ADY) arrived in Beirut on Aug. 10, and flew its first service on Aug. 11. Purchased by Air France, it will take the place of the Caravelle which has hitherto been chartered by Air Liban for one return flight a week to Paris.

MORE UNITED VISCOUNTS.—Since the Capital-United Air Lines merger, the latter company has been "very favourably impressed with the operating economy of [the Viscount] and its performance in daily service," according to Mr. W. A. Patterson. Consequently, six of the 15 Viscounts which were returned to Vickers as part payment of Capital's debt have now been repurchased by United, to bring the total fleet to 47.

U.S.-U.S.S.R.—Agreement has been reached on all the basic questions in the U.S.-Soviet civil aviation negotiations in Washington. Talks have since been held between Pan American and Aeroflot, the two airlines which will operate the Moscow-New York services—possibly next year.

880-M CERTIFICATED.—An F.A.A. certificate was issued last month for the Convair 880-M after a nine-month test programme. Operating weight increases have been applied to the Convair 880 and 880-M. The former's maximum landing weight has been raised from 132,800 lb. to 137,000 lb. and the 880-M has a new maximum take-off weight of 192,700 lb. (previously 191,000 lb.) and the maximum zero fuel weight has been increased to 125,000 lb.

MODERNIZED TU-104.—Czechoslovak Airlines has put into service the first of its Tu-104s with modernized interiors. Features include seat rails—which allow changes in the passenger layout and permit 11 extra passengers (81 in all) to be accommodated on tourist-class flights—blocked-in luggage racks (in place of brass rails), built-in seat-back trays and a modern décor.

T.W.A. FINANCE. — Arrangements have now been completed by T.W.A. to finance its purchase of 20 Boeing 707-131Bs and six 707-331Bs (see p. 203 of this issue).

WEST INDIES OPENING. — On Jly. 27 the new terminal building at Kingston's Palisadoes International Airport, Jamaica, was officially opened by the Prime Minister, the Hon. N. W. Manley, M.M., Q.C. This completes the major part of the development of the airport which was planned in 1952 and which started with the laying down of a new "dredged-fill" runway foundation in Kingston Harbour.

SYDNEY EXTENSION. — Runway 16/34 at Sydney International Airport—otherwise Kingsford Smith or Mascot—is to be extended so as to provide two runways which are usable by heavily loaded turbojets. Most of the extension to 7,500 ft. (from the present 5,500 ft.) will be built out southwards across Botany Bay where about four million tons of sand will be dredged out.

P.A.A. LOSS.—Pan American recorded a loss of $2.5 million in the first half of 1961, compared with a net profit of $2.3 million in the first six months of 1960.

COMETS CLEAR.—Following trouble with fractures in the starboard undercarriage front axle beams of two Comet 4s—in Persia and Brazil—B.O.A.C. last week completed an examination of the entire fleet. No fractures were found in the remaining aircraft and the fact that two aircraft were in trouble at the same time may, in B.O.A.C.'s view, have been a coincidence.

50 MILLIONTH.—New York International Airport handled its 50 millionth passenger on Aug. 14. Departing for Paris on an Air France 707, she was Mrs. James B. Penson, seen here with, left to right, Mr. Vincent A. Carson, airport manager; her husband; and Mr. Julien Ogier, Air France station manager.

News About People

NATO F-104 AGENCY.—At the beginning of August, General Zattoni, Italian Air Force, was elected chairman of the board of directors of the NATO F-104 agency. The other members are senior officials from the Ministries of Defence of Germany, Belgium, Netherlands and Italy, plus an official from the NATO production office in Paris and a U.S. diplomat. The office of the manager, Herr Sellschopp, is in Coblenz.

CRANFIELD APPOINTMENT.—Mr. H. Harris is to become secretary to the governing body and registrar of the College of Aeronautics in October. At present he is secretary to Nottingham University School of Agriculture.

A.W.A. VISITORS.—Earlier this month members of Lufthansa visited Armstrong Whitworth Aircraft at Baginton to see Argosy production and to discuss loading and cargo handling of the freighter. They are seen here with A.W.A. personnel after witnessing a Rolamat demonstration.

M.N.A.O.A. CHANGES.—Mr. S. R. Smith has been appointed National Secretary (Air) of the Merchant Navy and Airline Officers Association following the resignation of Mr. J. G. K. Gregory who is joining British United Airways.

MR. PROCTOR-GREGG.—The death occurred at his home, Drumrunie, Station Road, Tring, Herts, on Aug. 18 of Myles Proctor-Gregg, 65, formerly publicity manager, Rolls-Royce, Ltd. Mr. Gregg served in the R.F.C. and then the R.A.F. from 1915 until 1919. Before going to Rolls-Royce in 1944 he was publicity manager to the Bristol Aeroplane Co., Ltd.

MR. F. BOND. — Newton Brothers (Derby), Ltd., announce with much regret that Mr. F. Bond, sales director of the company, died on Aug. 16 after a short illness. He had been associated with the company since 1927 and a director since 1952.

Personal Flying

A GREAT deal of support was apparent at a recent meeting to discuss the formation of the Blackbushe Aero Club, when over 100 prospective members were signed on, with promises of many more.

Many of the qualified members have over 100 hr. flying each, and some have C.P.L.s or A.L.T.P. licences. A range of aircraft from Turbulents to Tiger Moths was suggested, and with the help of the Tiger Club and several private owner members, there appeared to be little difficulty in obtaining equipment. A committee was elected, with Mr. D. Walker as chairman, Mr. and Mrs. K. Gray as secretary/treasurer and assistant secretary and 12 other members.

• • •

On Jly. 26 a meeting at which representatives of eight flying training organizations were present was held in the A.B.A.C. offices to discuss flying rates. Most club and school operators have found that they have been working at a loss, and the conference was held largely to decide how to rectify this.

One large flying club charged £4 an hour for Tiger Moths in 1938 and many operators are charging about this figure today, which does not seem realistic. All present agreed that rates would eventually have to be increased, but the only immediate action was to raise costs by 2s. 6d. an hour to cover the extra tax on petrol recently applied by the Government.

The Liverpool Flying Club has started a development fund for the acquisition of modern training aircraft, with suitable equipment, and new clubhouse premises. It is estimated that £12,000 will be required to provide equipment of a suitable standard to operate within the regulations of the Manchester Control Zone.

In January this year the Liverpool Corporation accepted control of the administration of Liverpool Airport, and is now in the process of developing it for general aviation purposes. Private flying is included in this development scheme, which also takes note of the progress of business flying. The future existence of the club will not only serve to foster more local interest in active flying, but will also provide for facilities and assistance to private aircraft visiting Liverpool.

• • •

The Norfolk and Norwich Aero Club, in its July newsletter, says that the club's formation flying team was well received at the Sculthorpe (U.S.A.F.) Open Day and has been invited to take part in the Battle of Britain display at Coltishall.

During June the club doubled its June, 1960, hourage with a total of 145 hr. 25 min.; gliding hours totalled 78 from 82 launches. A full-time ground engineer has been appointed and "Taffy" Rich, the chief flying instructor, is thus relieved of his responsibility for the maintenance of the club aircraft. This appointment coincided with the purchase of a new club aircraft—an Auster Autocar, G-ARKG, which will be fitted later with two-way radio.

Gliding Notes

by Dr. A. E. Slater

AT the United States Championships in Kansas—after a successful opening day, followed by two days of low overcast when only Bill Coverdale conquered the elements in his Ka-8—a second contest day was achieved in which nobody got round a 148-mile triangle, but everybody went far enough (62 miles) to score. Best was Bernard Carris with 126 miles in the old RJ-5—the same which put up the present World's distance record 10 years ago. But Dick Schreder still held the overall lead with his new HP-10, a remarkable all-metal machine of his own design with a rectangular wing of 48 ft. span, 20.6 aspect ratio, an estimated best gliding angle of 1 in 40 and minimum sink of 1.6 ft./sec.

In second and third place at this stage were a Skylark 3f and 3d, flown respectively by Gale Abels and Bill Ivans.

A chaotic sky with clouds at many levels, due to the arrival of cold air at 20,000 ft., heralded the fifth day of the meeting. But all these clouds added up once again to an almost complete overcast. The task was 96.4 miles out-and-return plus any greater distance in any direction which the pilot chose to take after crossing the finishing line. But only two scored: Coverdale completed the course and then set out once more for the turning point, making 113 miles altogether, and Lyle Maxey, with 84 miles, did not quite get back.

On the sixth day there were, for the first time, no stratus clouds in sight, though the met. man, Ted Lange, was seen to be carrying an umbrella. The task was 199 miles out-and-return plus additional distance in any direction, and John Ryan, in the Sisu, not only won the day with 333 miles but headed the contest with 2,672 total points to Schreder's 2,661.

This third contest day was immediately followed by a fourth in which, in a free-distance task, Schreder, with 380 miles, regained first place from Ryan with 259, but only led by four points. Then, according to the Bulletin, "the area's usual nocturnal developments (mixing of warm surface air with upper cold air associated with the jet stream) had been active during the night to the west, producing precipitation and resulting in intermediate clouds that were moving over the area." So, although a 100-mile out-and-return was set, there was no contest, though Gale Abels made the turning point in the Skylark 3f, formerly owned by Philip Wills.

The last day dawned with Schreder menaced by 14 other competitors within 1,000 points of him, and, failing to complete an 81-mile downwind race, he dropped to ninth place. The race was won at 42.2 m.p.h. by Andrew J. Smith in a Lo-150, who thereby became 1961 Champion with 4,564 points in five contest days. Bill Ivans, with a Skylark 3d, came third in the race and finished second in the whole contest, followed by Rudolph Allemann in a Ka-6CR, Paul Bikle in a Prue Standard, Kit Drew in a Ka-6B, and Dick Johnson in his Adastra 2. Coverdale finished 14th, Maxey (with an old Polish Orlik) 23rd and Carris 27th out of 36 competitors.

Cessna Aircraft Corporation provided the tugs, and Beech A.C. two Bonanzas for the turning-point observers.

* * *

FROM Upavon in Wiltshire John Williamson, of the R.A.F., has made two notable flights. On Jly. 22, with a light gradient wind from N.E., he set out in an Olympia 419 for Ruabon, just inside Wales, in the hope of going there and back and beating the U.K. out-and-return record. However, he ran into total clamp at the Long Mynd, 30 miles short, at 15.00 hrs., so returned from there to Upavon, covering 200 miles in 7½ hours. Best height was 4,500 ft., the best thermals gave 7 ft./sec. except for one of 10 ft./sec.

Then, on Aug. 8, Williamson set off for another border—the Scottish one this time—and succeeded in crossing it to a landing at Ayton, near the Berwickshire coast, 315 miles away. The course was due north, across a fierce west wind which obliged those returning south from the Camphill meeting to keep a tight grip on their steering wheels.

When down to his lowest point, at 1,000 ft. near Darlington, which is 18 miles inland, he encountered a weak sea-breeze front which extended 90 miles from there to Berwick. The front was marked by smoke haze from the industrial towns, but the clouds produced by it were "pretty miserable" except for one which gave him 7 ft./sec. lift up to 6,000 ft. During what he thought was to be his final glide, a last thermal just enabled him to cross the 500-km. line.

Another sea-breeze front was encountered at Lee-on-Solent on Jly. 23 by Humphry Dimock, but he could not get a launch in his Skylark 3f till it had gone past. So, from a winch launch down wind, he chased it and overtook it to reach a thermal three miles inland over the parade ground at "H.M.S. Collingwood." In pursuit of the Pilcher Memorial Trophy, he set off northwards for Stanford Hall, 95 miles away, but missed it by six miles. So he informed Lord Braye—who, incidentally, is glad to hear of any attempts made to reach Stanford Hall.

* * *

A RACE to Hucknall and back, 58 miles, on the final day, Aug. 7, was won jointly by Mike Fairman of London Club and Humphry Dimock, each averaging 30.3 m.p.h., taking 1 hr. 55 min., though the fastest time, 1 hr. 45 min., was done by Mick Kaye, flying *hors concours* in his Eagle. Flg. Off. Peter Hanneman got into a cloud over Hucknall, rose to 7,200 ft. in it, and from its top made a straight glide back to Camphill in 25 min. at 75 m.p.h. Mike Bird was slowed up on the return lap by high cloud coming over and thus lost his overall lead.

So Lieut. Cdr. Humphry Dimock, the oldest competitor, won the contest with 446 points. Morison and Hanneman with the Army Club's Skylark 3f totalled 443, Bird 427, Bentson 368, and Goldney and Ibberson jointly 367. But for the rule about discarding the worst day, Bird would have scored 458 and Goldney and Ibberson 411, while everybody else's worst day's score was zero.

Correspondence

The Vanishing Crews

I READ Mr. Follows' comments on my recent article with interest; it appears we are in agreement on some points at least—even to the number of pilots being three. I cannot agree, however, that the provision of the third pilot does nothing to alleviate fatigue. The mere fact of being relieved of duties for a certain time enables any accumulated strain to be dissipated.

I thought it was clear that the article referred to long-haul operations, but the fact remains—I do not expect Mr. Follows will deny it—pilots are being used purely as navigators on many of the long-haul routes and I contend that this is a waste of a pilot *and* a navigator.

No one will deny the pilot shortage—it will probably become more acute—but are the best steps being taken to deal with it? No, Sir! Even IFALPA state they "have not felt able to support the retention of the so-called 'specialists' in cases where technical advance has clearly made them no longer necessary." "So-called" indeed! I'm all right, Jack.

Harpenden, Herts. R. LENZIE.

Comparing Apples With Oranges

IT is indeed heartening to read (C.C.J.'s "OPtional Reading," Aug. 3) that someone else is pointing out the manifest deficiencies of VOR and DME particularly when used as the basis of the sophisticated A.T.C. system which the air traffic of today demands. We are sufficiently gregarious to welcome another voice in the wilderness, even though, we are happy to report, this particular wilderness is becoming quite thickly populated these days.

However, I would like to make two comments on C.C.J.'s article. The first concerns his statement, "Nobody at the ICAO Sixth COM Meeting or at the 1959 Special Meeting, when 1,000 Mc. DME was accepted as a World standard, mentioned anything about the 960-1,215 Mc. band not being reserved for civil aviation; yet somebody must have known that a separate, and at times conflicting, military DME system was at that time going into operation." This is not quite fair, but it is an understandable error on C.C.J.'s part since the reports of the Conferences concerned may not record all that transpired. Nevertheless, it is a fact, as I know from being present, that at the 6th Communications Divisional Meeting, 1957, at the Special COM/OPS/RAC Meeting, 1959, and at the Eu-Med Meetings in Geneva and Paris, 1958 and 1960, the United Kingdom (M.o.A.) delegations drew attention to this frequency problem in the most emphatic terms and prophesied the difficulties which are now being encountered. It is equally true that the U.S. delegations at those same meetings assured all concerned that no problems existed or if they did, they, the U.S., would provide the solutions.

Secondly, I would like to comment on C.C.J.'s passing flick of the whip about Decca dependability. This is a feature, and almost the last feature, on which the opposition seeks to pillory us. Whilst I do not contend that Decca serviceability is, overall, as high as we would wish it to be, nevertheless I think the matter should be put in perspective.

I will admit, without further argument, that VOR has a higher order of serviceability than Decca. But this is to compare apples with oranges. The only fair comparison would be to equate the relative serviceabilities of Decca and its associated Flight Log with VOR plus DME plus a pictorial presentation.

Obviously such a comparison is difficult to make, since airborne installations comprising VOR/DME and pictorial presentation are not exactly commonplace. We can, however, gain some idea of how it would measure up by taking the example of TACAN.

TACAN has now been in operation for, roughly, 10 years but, despite this, a recent advertisement from the American Hoffman Corporation states that they have now produced an airborne TACAN the reliability of which has been increased 700%. They claim, indeed, that "the Mean Time Between Failures (M.T.B.F.) has been raised from 17½ hours to over 150 hours."

When one remembers the vast amount of money spent on improving it, by the U.S. Government, it is quite startling to read that now, 10 years after the introduction of TACAN, a company is congratulating itself on having achieved 150 hours between failures. And to remember, in addition, that this achievement does not include pictorial presentation.

We, however, gain no solace and certainly no complacency from someone else's troubles. I mention them only as a further proof that there are always at least two sides to every question—or in substantiation of whatever other cliché is relevant.

At the moment, we are obtaining about 150 hours M.T.B.F. with Mark 10 Decca and Flight Log and are steadily, if slowly, improving this; our Mark 11 is now being built with the object of attaining 800-1,000 hours M.T.B.F.

Lastly, unlike TACAN, we have had to do this without the benefit of Government money which, whilst it may not buy serviceability, certainly eases the way towards its achievement.

The Decca Navigator Co., Ltd. TED BONNER.
New Malden, Surrey.

Groundabout

Belt Up. Down at Ferryfield, on my way to a motoring holiday abroad, a Silver City traffic officer told me of a customer who, when he learned that he and his family would fly across in the Freighter's passenger cabin, said: "But why can't we sit in the car? It's fitted with safety belts for us all." He might have a point there. Put the passengers in the otherwise wasted space in their cars, do away with the cabin and make room for another car. Has to be seat belts all round, of course—hard work, too, for the stewardess to dispense the good old duty-free stuff. Let's forget the whole thing.

*

Built-in Headwinds. On the above-mentioned holiday, we passed a French nun cycling into a brisk breeze and looking rather like a black yacht in full sail. Junior Wren's comment: "Bags of drag, Dad."

*

Wind of Change. That old phrase "built-in headwinds" probably originated with the epic Hannibal airliner of Imperial Airways. Now we have our new, rear-engined Trident with built-in tailwinds and, unlike old Hannibal, built-in profits.

*

WREN'S LAW
of
DIMINISHING
RETURNS
In order to pay our way we have to raise our fares so fewer people can afford to fly which lowers our income so that we

*

Fruitful Sortie. In a recent report about a Blackburn Buccaneer which finished up inside a greenhouse full of tomatoes off the end of the Hatfield runway, we were reminded that the aircraft "is designed to go in and strike below the reach of enemy radar." But trying to do it at tomato-plant level is taking things a bit too far, surely?

*

Well, I'll go to Helsinki. I read that "Finnair has introduced their Simmer time-table." Personally, I have never flown with Finnair, but I will say that there *are* airlines which make me boil.

by Wren

Books Received

Aerospace Medicine. The former Surgeon-General of the U.S.A.F., Maj.-Gen. H. G. Armstrong, edits this volume, which contains 32 contributed chapters covering all medical problems of both civil and military aviation and astronautics. 634 pp. 6½ in. by 10 in. Illustrated. Bailliere Tindall and Cox, Ltd. 144s. (postage 2s. 9d.).

Boundary Layer and Flow Control. Edited by G. V. Lachmann. Thirty-eight international authorities contribute to this two-volume work. The history of boundary layer research in Germany, France, the U.K. and the U.S.A. is traced, and this volume then goes on to a discussion of general principles and a survey of the engineering features of BLC applications. 600 pp. 6 in. by 9 in. Illustrated. Pergamon Press, Ltd. £10 10s. the set of two volumes.

Hawker Aircraft Since 1920, by Francis K. Mason. A book for the collector, this volume reveals in the greatest possible detail the story of Hawker aeroplanes. A comparatively short general history of the company is followed by a type-by-type review in which each variant is described and illustrated; still more information, including a note of every individual aeroplane produced, is grouped in the Appendices. A vast amount of hitherto-unpublished information and many new photographs are included. 476 pp. 5½ in. by 8¼ in. Illustrated by more than 380 photographs, and 55 three-view drawings by L. E. Bradford. Putnam and Sons. 63s.

A Flying Command, by Tom Dagger. A serving officer who has himself commanded a Fighter Station, writes as a novel the story of a station commander in Germany. 224 pp. 5 in. by 7¼ in. 13s. 6d.

The Edge of Things, by William E. Barrett. Two novels and a short story with a flying flavour and a touch of the fantastic. 286 pp. William Heinemann. 18s.

Aerofoil Sections, by Dr. Friedrich Wilhelm Riegels. Surveys all the main theories, discusses many experimental investigations and includes a great amount of tabular and graphical information derived from wind tunnel investigations. Translated from the German by D. G. Randall. 284 pp. 8 in. by 11 in. Illustrated. Butterworth Scientific Publications. £10.

Industry Record

Comet Order—for Leyland

Forty long-wheelbase Comet truck chassis, worth £120,000, have been ordered from Ashok Leyland, Ltd., of Madras. These are to be fitted with 2,000-gal. tanks and will be employed by the Indian Air Force as aircraft fuellers.

Vehicles for B.O.A.C.

To help to deal with increased passenger and freight traffic at London (Heathrow) Airport, B.O.A.C. has ordered from the Rootes Group a further six Commer forward-control chassis/cabs and 12 Karrier Gamecock forward-control chassis. Both types have an 11-ft. 9-in. wheelbase and will be diesel powered. The Commers are to be fitted with special cargo hoist bodies and the Karriers with baggage loader coachwork.

Do-it-itself Liferaft

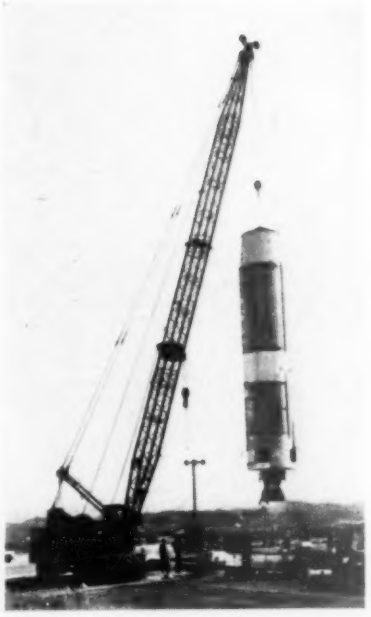
Joint research by the R.F.D. Co., Ltd., and the Walter Kidde Co., Ltd., has led to the development of a new system for the automatic inflation of single-seat liferafts. This has been achieved by the addition of a small-diameter high-pressure tube attached to the outside of the main buoyancy tube of a dinghy—basically the R.F.D. S.S. Mk. 5, which is utilized by the R.A.F. and a number of foreign Air Forces. The high-pressure tube inflates first and acts as a deployment tube, spreading the dinghy beneath the subject ready for inflation after a predetermined interval.

The purpose of the new system is to ensure a means of survival requiring the minimum of effort on the part of the operator. Provided the pilot is able to perform the ejection procedure from his aircraft, the rest can be left to the liferaft. Existing single-seat units require a good deal of manual operation.

Plessey and Semiconductors

The Philco Corporation of Philadelphia has sold its minority interest in Semiconductors, Ltd., of Swindon, to the Plessey Co., Ltd. By this transaction Semiconductors becomes the wholly owned subsidiary of Plessey and continues as a non-exclusive licensee of Philco with respect to the manufacture and sale of transistors.

Coles cranes manufactured by Steels Engineering Products, Ltd., have been chosen by the U.S. to handle certain missiles both during their manufacture and on launching sites. The two units illustrated here are in use with a Bomarc SAM (left), and a Titan ICBM (below).



Aviation Calendar

Sept. 1

London.—B.I.S. lecture, "Man in Space," by Dr. J. C. Guignard, I. B. Wright and Dr. W. F. Hilton, at the Royal Society of Arts, John Adam Street, W.C.2, at 18.30 hr.

Sept. 3

London.—Eighth Anglo-American Aeronautical Conference; until Sept. 14.

Wolverhampton.—Wolverhampton Aero Club At Home.

Sept. 4

Farnborough.—S.B.A.C. Exhibition and Flying Display; until Sept. 10. (Public days Sept. 8-10.)

Sept. 8

Cranfield.—Popular Flying Association Rally; until Sept. 10.

Sept. 12

London.—R.Ae.S. 49th Wilbur Wright Memorial Lecture, "Researches in Space Flight Technology," at 4 Hamilton Place, London, W.1, at 19.00 hrs.

Sept. 13

Baden-Baden.—German Aero Club Second International Sporting Pilots' Rally.

Sept. 16

R.A.F. At Home.—Battle of Britain Day; 16 R.A.F. stations open to the public.

Company Notices

NEW COMPANIES

Aircraft Accessories, Ltd. (700,236).—Private co. Reg. Aug. 8. Cap. £500 in £1 shs. To carry on the business of aeronautical experts and consultants. Directors: George E. Brett, 139 Frimley Green Road, Frimley Green, Aldershot. David W. Thornton, Les Landes, The Hatches, Frimley Green, Aldershot.

Croker (Cheltenham), Ltd. (700,323).—Private co. Reg. Aug. 9. Cap. £100 in £1 shs. To acquire the business carried on by E. A. Croker at Charlton Kings as manufacturer of and consultant and adviser in connection with the transportation and merchandised handling of airfield equipment and aircraft cargoes. Sec.: Shirley Hart. Reg. off.: Brown Knoll, New Court Park, Charlton Kings, Cheltenham.

R. K. Dundas Aero, Ltd. (700,586).—Private co. Reg. Aug. 10. Cap.: £8,050. To carry on the business of manufacturers of and dealers in aeroplanes, seaplanes. Directors: Peter J. Phillips, Red Lodge, 55 Loom Lane, Radlett, Herts. Neil K. McCallum, Hawly Farm House, Hawly, nr. Camberley, Surrey. Reg. off.: 59 St. James's Street, S.W.1.

David Mawhood and Co., Ltd. (700,652).—Private co. Reg. Aug. 11. Cap. £1,000 in £1 shs. To carry on the business of consultants, representatives and advisers in the field of aviation, electronic, industrial and scientific affairs. Directors: David V. G. Mawhood and Mrs. Margaret M. Mawhood, both of 90 Warwick Gardens, W.14. Sec.: Margaret M. Mawhood. Reg. off.: 54 Cannon Street, E.C.4.

Rent-a-Copters, Ltd. (700,617).—Private co. Reg. Aug. 11. Cap. £10,000 in £1 shs. To carry on the business of dealers in and hirers of aircraft of all types and kinds. Sec.: W. G. L. Forwood. Reg. off.: 2 Lowndes Street, S.W.1.

New Patents

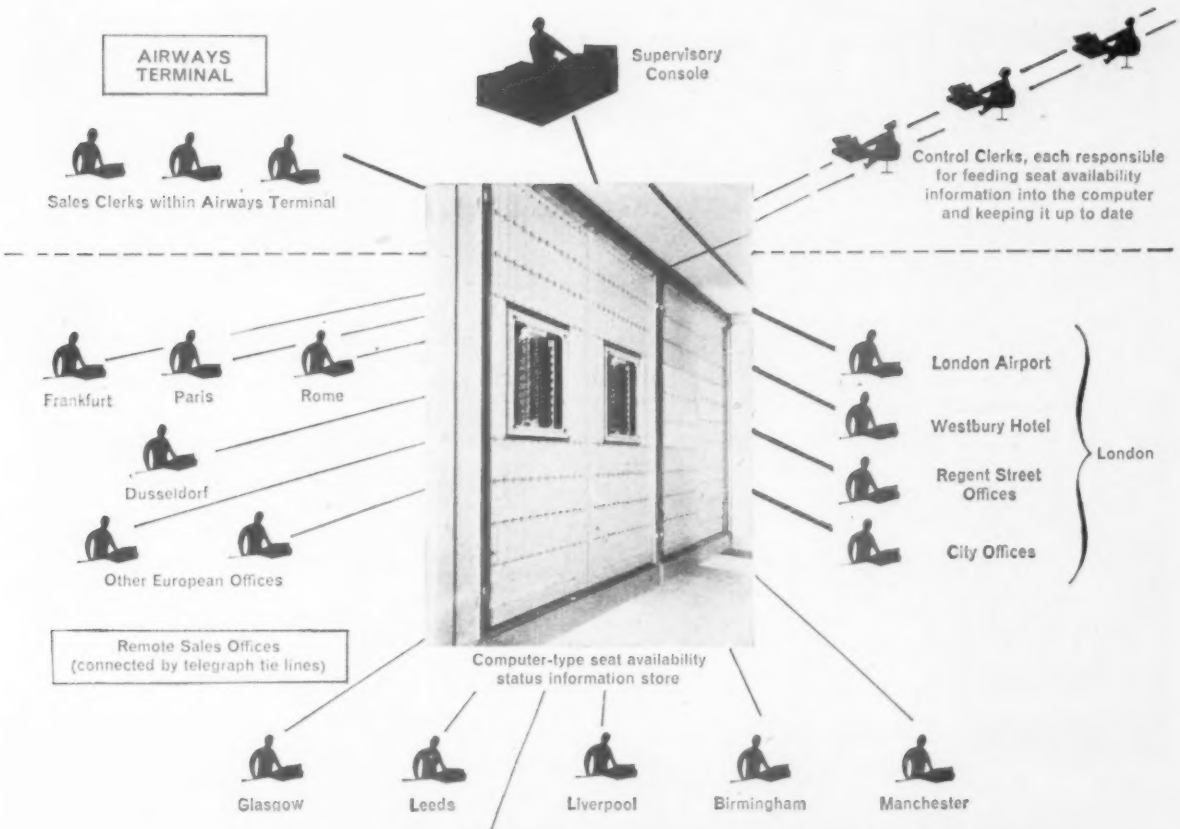
APPLICATIONS ACCEPTED

878,355.—**Curtiss-Wright Corporation.**—"Lift computing systems for aircraft ground training apparatus." Jan. 1, 1959 (Jan. 13, 1958).

878,385.—**Recherches Etudes Production S. Ar. L.**—"Multi-purpose aircraft landing gear with wheels in tandem." Jly. 15, 1959 (Sept. 3, 1958, and Sept. 10, 1958).

878,472.—**Rolls-Royce, Ltd.**—"Vertical take-off aircraft." Jan. 1, 1960 (Jan. 8, 1959).

Printed specifications of the above will be available on Sept. 27, 1961, and the opposition period will expire on Dec. 27, 1961.



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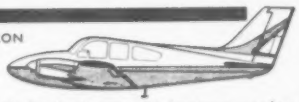
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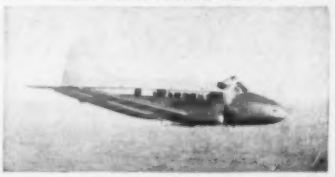

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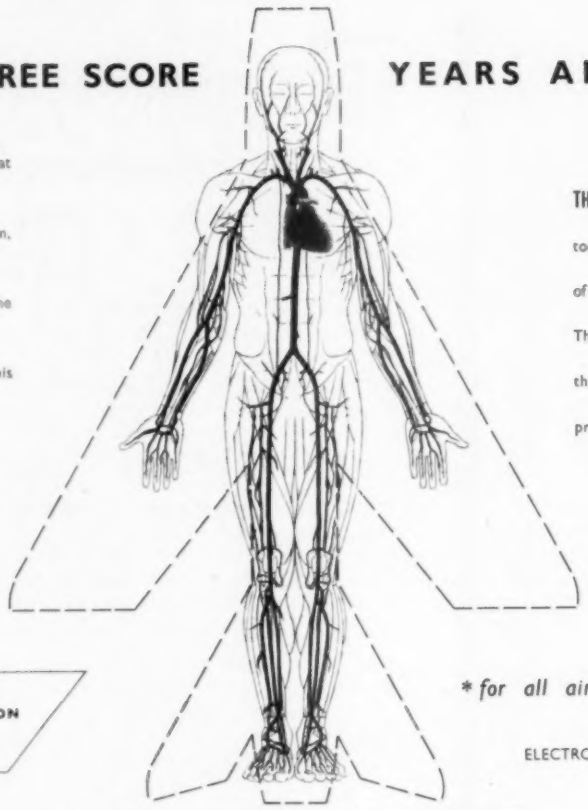

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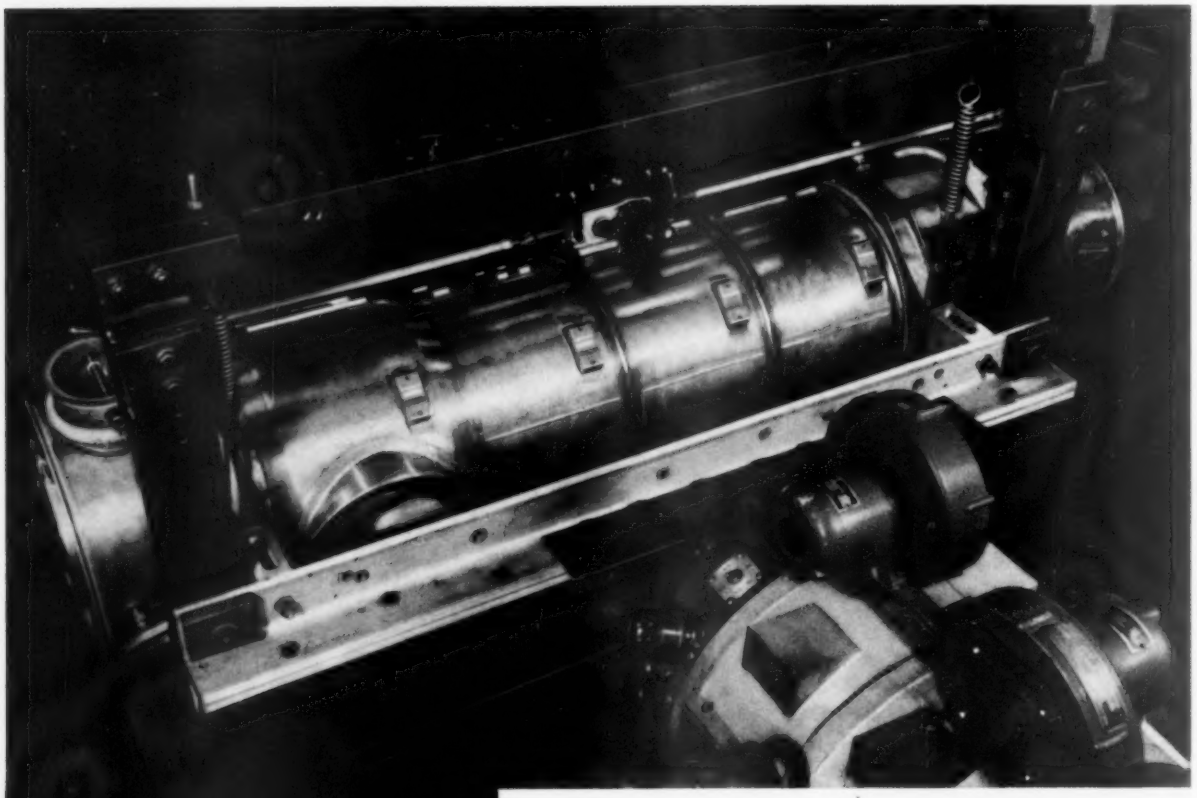

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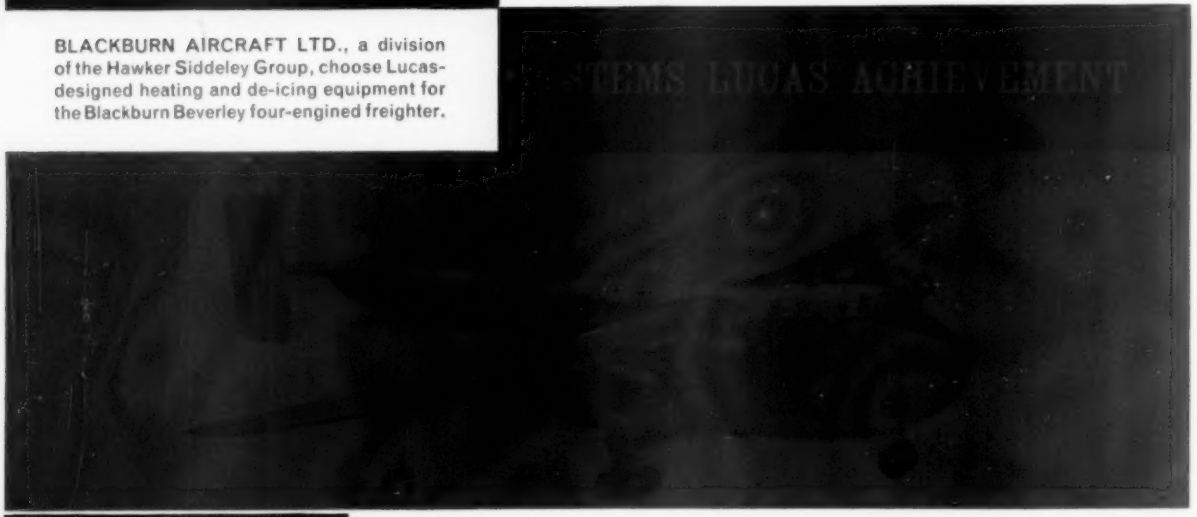

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